WESTERN SUBURBS GREENING PLAN

2020-2025

WESTERN SUBURBS REGIONAL ORGANISATION OF COUNCILS

[science+design]
ecoscape

Image: Forest Red-tailed Black Cockatoo | Sally Wallace
Image cover: Bold Park | Ecoscape

Dataset Disclaimer : Remnant vegetation figures and statistics are derived from the current remnant vegetation spatial dataset. The data has been captured using digital aerial photography from 1996-2020 and is updated annually (DPIRD, 2020). There may be some inconsistences between the 2002 and 2020 spatial datasets that have resulted in the increased bushland extent, for example groups of parkland trees may be identified as bushland. Ecoscape have not corrected the remnant vegetation layer which would require a combination of aerial interpretation and ground-truthing. Reference: Department of Primary Industries and Regional Development (DPIRD) (2020) Remnant Native Vegetation (DPIRD-005) Spatial Dataset. DPIRD, WA. Available: https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent

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ACKNOWLEDGEMENTS

ACKNOWLEDGEMENT OF COUNTRY

The Western Suburbs Regional Organisation of Councils (WESROC) acknowledges the Whadjuk Noongar people as the traditional custodians of Whadjuk Country, the land, waters and seas on which we operate. The region is a significant meeting place for the Whadjuk Noongar and surrounding Aboriginal Nations who have gathered here for thousands of years.

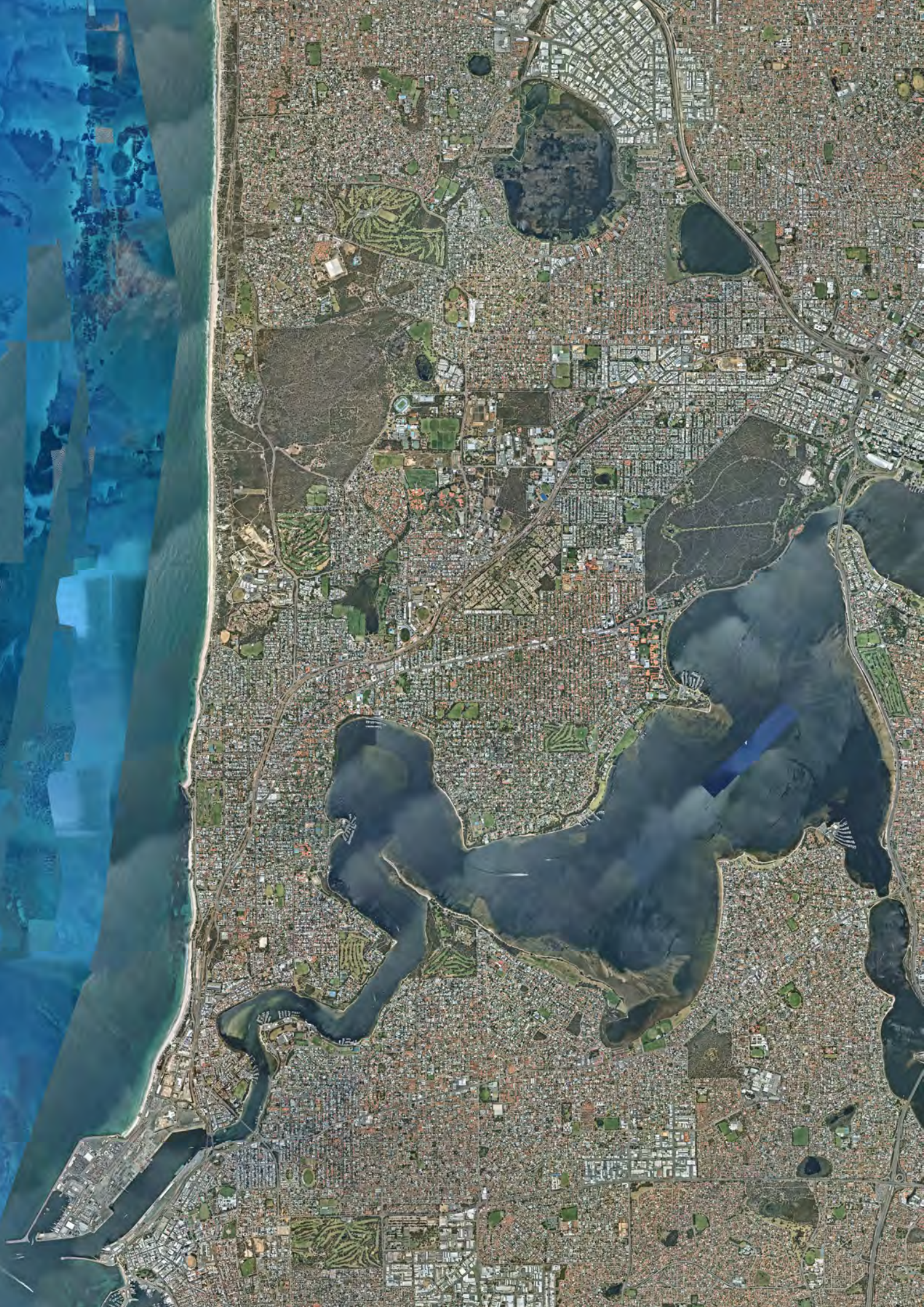
WESROC recognises the Whadjuk Noongar people's deep spiritual connection to and unique ability to care for Country. WESROC respects the Aboriginal and Torres Strait Islander people, their enduring culture and the contributions they make to the region. We pay our respects the Elders past and present.

CONTRIBUTIONS TO THE GREENING PLAN

Ecoscape would like to thank the following people for their contribution to the development of the Western Suburbs Greening Plan 2020-2025:

- Sally Wallace, WESROC Environmental Project Officer
- Sharon Munro, WESROC Environmental Project Officer
- Adeline Morrissey, Town of Cottesloe
- Paddy Strano, Town of Mosman Park
- Nic King,Town of Claremont
- Sue Waite, Town of Cambridge
- Donovan Norgard, Shire of Peppermint Grove
- Veronique Largier, City of Subiaco
- Vicki Shannon, City of Nedlands.

Image left: Allen Park | Sally Wallace



1.0 THE VISION

Our vision is that by 2050 the Western Suburbs region forms a thriving, resilient and self-sustaining biodiversity corridor, where the community values and actively contributes to the health of the environment and endemic flora and fauna flourish in biodiversity rich habitats.

The Western Suburbs Greening Plan is a joint venture between the six member Councils of the Towns of Claremont, Cottesloe and Mosman Park, the Cities of Nedlands and Subiaco, and the Shire of Peppermint Grove that comprise the Western Suburbs Regional Council (WESROC) and in partnership with the Town of Cambridge. The co-ordination capacity of WESROC enables a more integrated and powerful approach to regional environmental planning particularly for the Greening Plan.

AIMS

The aims of the Greening Plan are to:

- identify areas of remnant vegetation within the project area
- identify the potential to link these areas to form an integrated, cohesive network of greenways
- develop policies and broad management guidelines for the conservation, protection and enhancement of the identified greenways
- prepare broad management guidelines for the conservation and enhancement of local biodiversity
- recommend areas suitable as sites for establishing appropriate endemic habitats
- identify opportunities for the local community to participate in the conservation and enhancement of local biodiversity.

WHO IS WESROC?

WESROC was formed in 1995, comprises of the Towns of Claremont, Cottesloe and Mosman Park, the Shire of Peppermint Grove and the Cities of Nedlands and Subiaco along with the Town of Cambridge who work on a voluntary partnership on projects across or on shared boundaries, and to address cross-boundary regional issues.

WESROC is not a regional local government formed under section 3.61 of the Local Government Act 1995, and as such requires a lead council to provide administrative, financial and contractual arrangements for and on behalf of participating members. The lead council is the City of Nedlands.

WHAT IS A GREENING PLAN?

A Greening Plan is a structured and systematic approach to managing, protecting, preserving and enhancing vegetation in parks and reserves, private land and road reserves. It includes rehabilitation of degraded areas, securing open space and developing and enhancing linkages between green areas to maintain environmental values.

A Greening Plan focuses on opportunities for both public and privately-owned private land managers to increase overall tree canopy cover, and create endemically focused greenways, which will promote a higher quality of liveable neighbourhoods and foster biodiversity values.

WHY DO WE NEED ONE?

As our cities grow, it's important to consider the infrastructure and development impacts have on our natural areas. What was once a complex dune and floodplain system is now covered in concrete and built form - how does that affect the area's ecosystem?

Perth has one of the fastest growth rates in Australia, with an estimated population of 2.17 million by 2025. The challenge for local governments is to balance the competing demands to provide infrastructure and development to support population growth with the pressures on biodiversity, amenity, accessibility and resilience of our urban greenways.

Image left: Nearmap 2019

ECOSYSTEM SERVICE APPROACH

Ecosystem services are vital for humans in urban regions, however urban development poses a great risk for the ability of ecosystems to provide these services. The most important ecosystem services provided by urban nature in functional urban areas, such as the WESROC area, are an important part of the high-quality living environment and public health.

Ecosystem services can be defined simply as the benefits natural ecosystems supply to guarantee human well-being. Although the human species presents a certain level of detachment from the direct relationships with the environment, especially due to cultural and technological issues, we are still fundamentally dependent on the flow of ecosystem services. For instance, a car can only move with fuel (gas, electricity, biodiesel, etc.), construction is only possible with raw material, our breathing depends on the production of oxygen by photosynthesizing organisms...

The ecosystem service approach and its application as a tool for integrated coastal management. Carla I. Elliff , Ruy K.P. Kikuchi Natureza & Conservação Brazilian Journal of Nature Conservation 2015 Published by Elsevier Editora Ltda.

Refer graphic right.

For example within the WESROC boundary, existing and remnant vegetation can have a role in carbon dioxide sequestration and thus in climate change mitigation. For example, estimates of carbon sinks can be compared to total CO2 emissions of an urban area, and the LGAs that make up the WESROC can aim at both increasing carbon sinks and decreasing CO2 emissions with considered land-use planning across the whole region. Large and contiguous core natural areas, smaller green areas, and ecological connections between these spaces are the essence of regional ecological networks and are essential for maintaining interconnected habitats for species and biological diversity. Both local and regional level ecological networks are vital for maintaining ecosystem services in urban regions, particularly within small LGAs. The impacts of climate change coupled with land-use and land cover change will bring serious challenges for maintaining ecosystem services in these areas.

The ecosystem services approach to greenspace planning and policy, such as this Greening Plan, provide an opportunity for land-use planning to develop ecologically sustainable urban regions across broader services. For example studies show that is not possible to clearly separate the areas of influence within a coastal ecosystem of oceanography, geology, and biology as the flow of services is very interactive. Elliff & Kikuchi, state that more than one service can be delivered by the same ecosystem, while the same service may be delivered by different ecosystems. Thus, by considering this interactivity, by means of including multidisciplinary teams in decision-making processes and taking an integrated view of the environment, it is possible to understand the limits of the environment and its resources, creating policies that allow for sustainable development.

By integrating the ecosystem service approach and the decision-making process in greenspace policy and planning, ecosystem-based management strategies can be developed. While isolated these processes of management such as in WESROC by LGA boundary, the decision-making process considers social preferences and human activities without necessarily accounting for the inherent value of nature or the benefits provided by ecosystem services. However, by striving for more sustainable and resilient policies, LGA managers understand that an ecosystem-based management strategy would allow an integrative approach toward the issue at hand, valuing the natural capital of the area, respecting the environment's carrying capacity and reaching long-term and fair benefits to all involved.

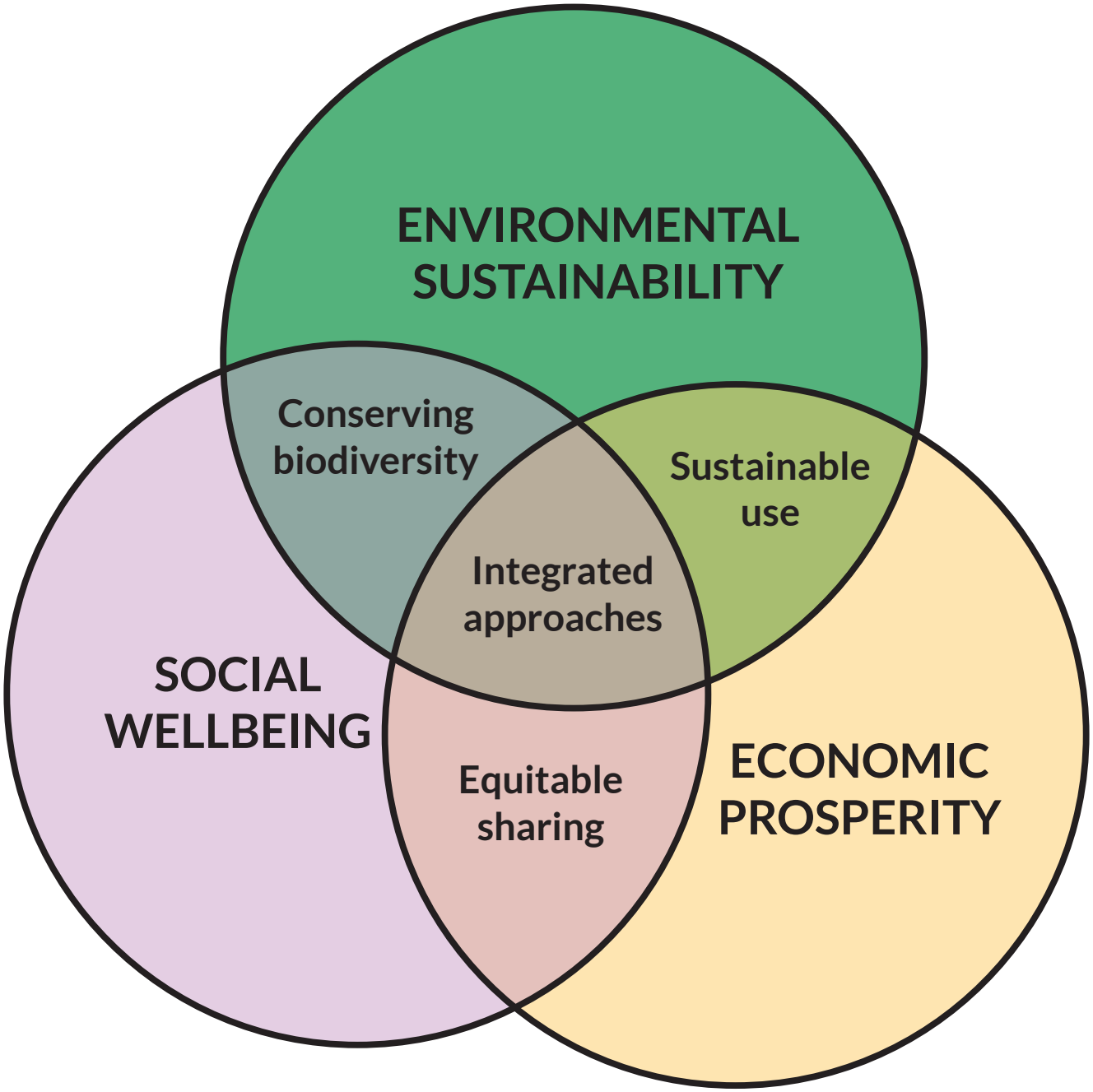
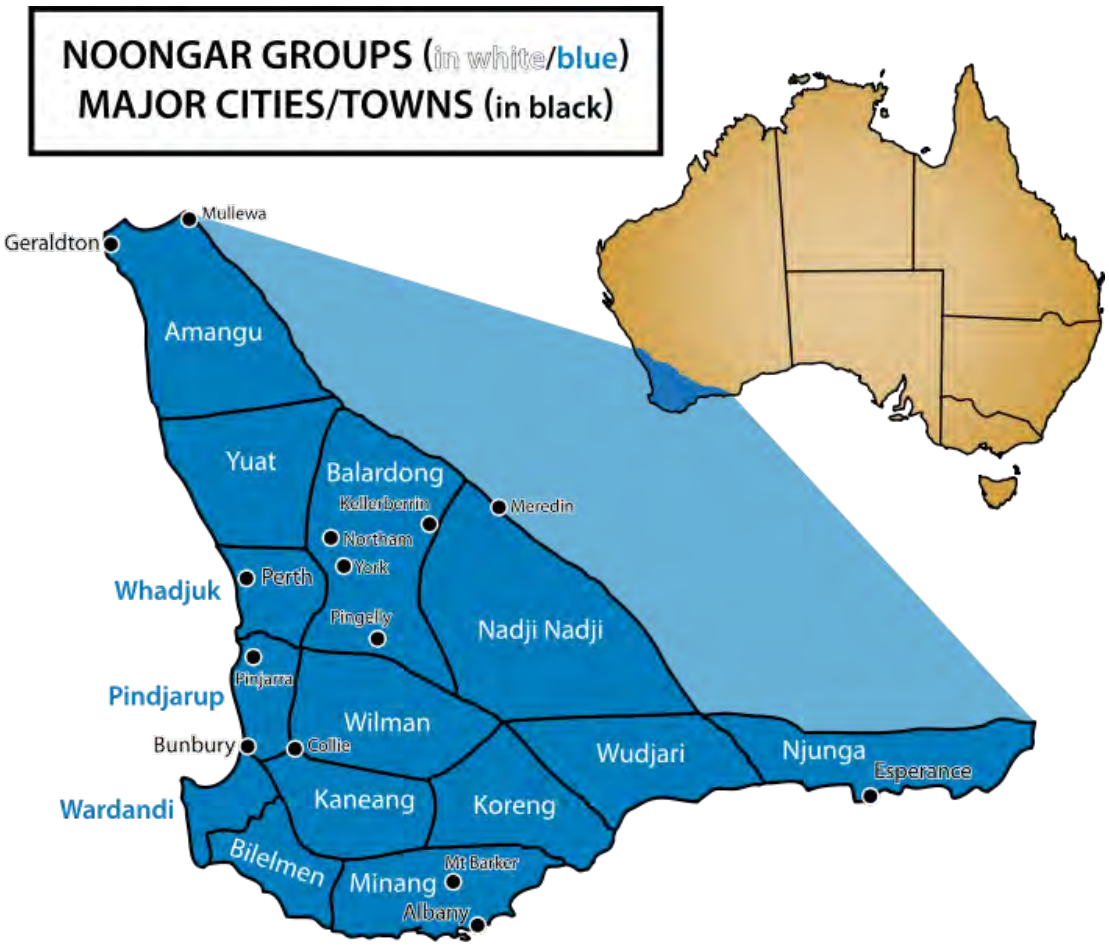


Image: Ecosystem Service Approach Graphic



60,000 years ago - Before contact

Aboriginal peoples are the oldest surviving culture in the world, having established ways of managing their land and society that were sustainable and ensured good health. They have occupied Australia for at least 60,000 years. While there was significant contact and trade between the diverse peoples who inhabited this continent, there was no contact, no exchange of cultures or knowledge between Indigenous Australians and the rest of the world.

http://www.shareourpride.org.au/sections/our-shared-history/

2.0 INTRODUCTION TO WESROC

ABORIGINAL CULTURE

It has been acknowledged that traditionally the region of Perth in which the Noongar resided was part of the Whadjuk territory. Whadjuk's territory extends: "... Swan River and northern and eastern tributaries inland to beyond Mount Helena; at Kalamunda, Armadale, Victoria Planes, South of Toodyay, and western vicinity of York; at Perth; south along the coast to near Pinjarra". *Indigenous history of the Swan and Canning rivers, 2010*

For thousands of years Noongar people have resided on and had cultural connection to the booja – land. Everything in our vast landscape has meaning and purpose. We speak our own language and have our own lore and customs. The lore is characterised by a strong spiritual connection to country. This means caring for the natural environment and for places of significance.

Our lore relates to ceremonies, and to rituals for hunting and gathering when food is abundant and in season. Connection to booja is passed on through our stories, art, song and dance. Noongar people not only survived European colonisation but we thrived as family groups and sought to assert our rights to our booja. For Noongar people, the south-west of Western Australia is ngulla booja – our country. *(https://www.noongarculture.org.au/connection-to-country/)*

Whadjuk is the name of the dialectal group from the Perth area. Whadjuk is situated south of Yuat and north of the Pinjarup dialectal groups. The major cities and towns within the Whadjuk region include Perth, Fremantle, Joondalup, Armadale, Toodyay, Wundowie, Bullsbrook and Chidlow. The approximate size of the Whadjuk region is 5,580 km.

Throughout the Whadjuk Region there are a range of significant Noongar sites. For instance, Ngooloormayup, known as Carnac Island; Meeandip, known as Garden Island; Gargangara north of Armadale; and Goolamrup, the suburb known as Kelmscott. Noongar people may refer to Kings Park as Karra katta or the hill of the spiders or Geenunginy Bo, the place for looking a long way. Dyarlgarro Beeliar is known as the Canning River and Derbal Yiragan, the Perth estuary waters. *https://www.noongarculture.org.au/whadjuk/*

The inhabitants and custodians of the coastal strip between Yanchep and Fremantle were collectively known as the Mooro. The Mooro were lead by Yellagonga who had territorial control over this vast domain. Yellangonga's group was one of several that were collectively known as the Whadjuk, who were based around the Swan River. Whadjuk was a part of the greater group of fourteen, which formed the south west socio-linguistic block still known today as Noongar.

The Noongar people lived in balance with the natural environment, the main source of food came from the sea, the Swan River and the extensive system of freshwater lakes that once lay between the coast and the Darling Escarpment. Their social structure was focused on the family with Noongar family groups occupying distinct areas of Noongar Country. *(South West Aboriginal Land and Sea Council)*

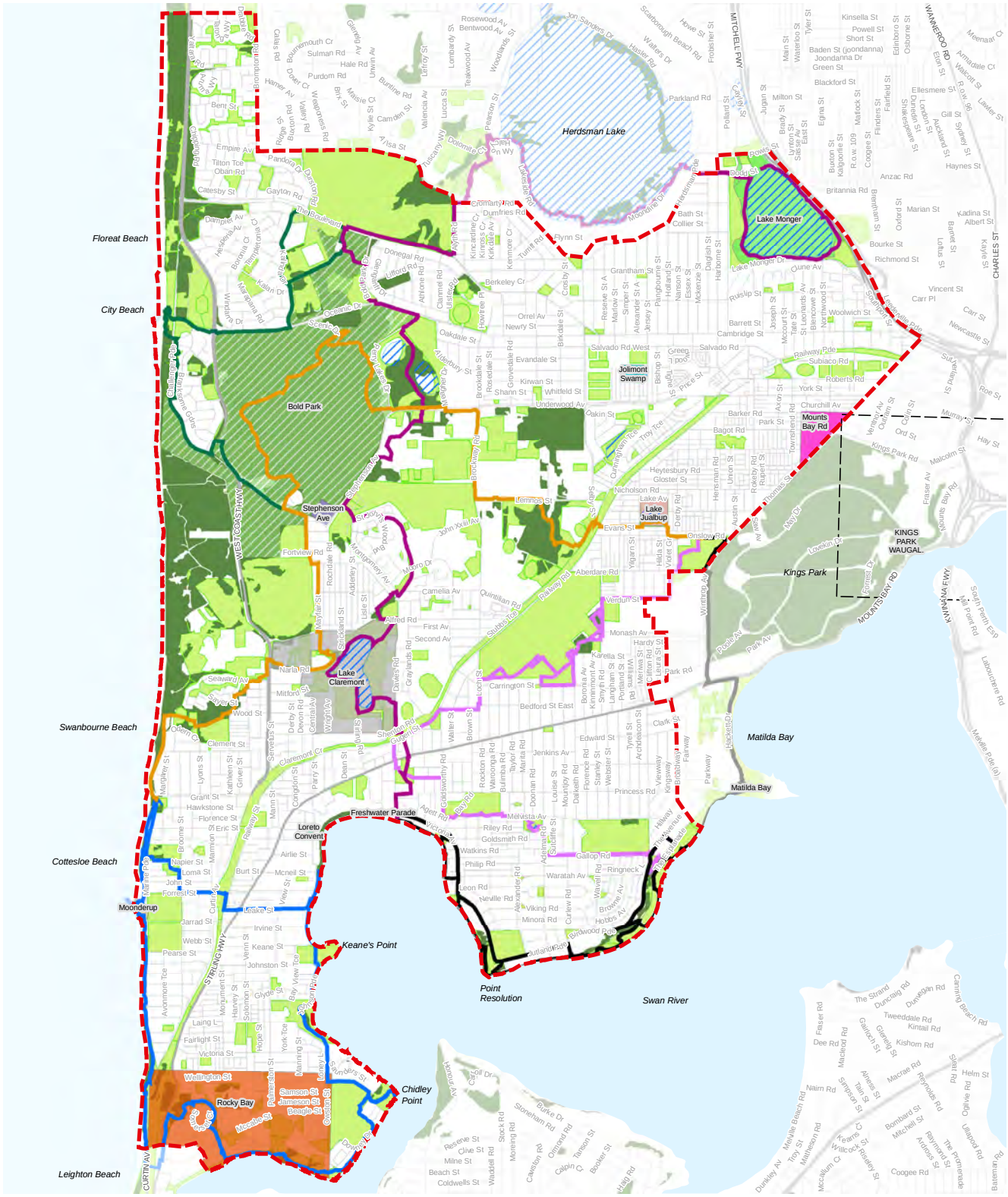
The lake system and wetlands, from Yanchep in the North to Galup (Lake Monger) and including Ngoogenboro (Herdsman Lake) throughout the coastal dune system and the Swan coastal plain, provided a strong economic base for Noongar people. The wide variety of ecosystems, aquatic vegetation, and forests supplied fresh water, fish, birds and waterfowl along with kangaroo and other small animals for food and clothing, tools for hunting and materials, and resources for building shelters and for trade with neighbours.

Their society was well established and structured. There has always been a strong focus on family and extended family. The community consists of Elders both male and female, spiritual leader, family groups and children. The Law and Dreaming is passed on through stories, dance, painting and caribberie - corroborees.

They were a hunter, gatherer, fisher clan who maintained a small, environmentally sustainable population.

It was for this reason that Aboriginal people were able to sustain a continuous and harmonious lifestyle for over 60,000 years.

Image top left: Noongar Regions Map
Image bottom left: Derbal Nara Whadjuk boodjar (https://www.derbalnara.org.au/whadjuk-boodjar)



LEGEND

- WESROC Boundary

Whadjuk Trails

- Bush to Beach
- Wardun Beelier Bidi
- Yange Kep Bidi
- Karda Bidi
- Karak Bidi
- Bidi Bo Djinoong (unmarked)
- Waterbodies
- High Density - Bushland
- Open Space (not bushland)

Aboriginal Heritage Places (DAA, 2019)

- Bold Park
- Freshwater Parade
- Jolimont Swamp
- Lake Claremont
- Lake Monger sites
- Loreto Convent, Claremont
- Lake Jualbup (Shenton Park Lake)
- Moonderup
- Mounts Bay Road
- Rocky Bay
- Stephenson Avenue
- Kings Park Waugal*

*A portion of this site occurs within the WESROC boundary

Figure 1: Aboriginal Heritage Sites & Trails Plan

Prior to European settlement, the Whadjuk and Mooro people hunted on the land extending along the whole of the Swan River's north bank from Garunup (Rocky Bay) to Booriarup (Point Currie), then north again to a point a little south of the Moore River. One of the favourite camping places of the Mooro was near the corner of Archdeacon Street and Edward Street, where water existed in a shallow spring (Williams, 1984).

Nedlands and Kings Park were prime hunting grounds. The river, swamps and coastal lakes contained an abundance of wildlife. They contained a wide variety of food, including fish, waterbirds, turtles, marsupials, vegetable foods and fresh water. Aboriginal women went crabbing and prawning around Matilda Bay, a stretch of water they called 'godroo' or 'gurndandalup'. Favourite meeting places included Jualbup Lake, Hyde Park and Lake Claremont (Williams, 1984).

The register of Aboriginal Sites administered by the Department of Aboriginal Affairs (DAA) indicates 12 heritage sites within the Western Suburbs. These sites are located on Figure 1.

Figure 1 maps the Whadjuk Trails across WESROC. The Whadjuk network of walking trails lies on Noongar land, connecting remnant bushland areas in the western suburbs of Perth. With links to iconic, heritage and Noongar trails in the area, they offer users a unique experience and appreciation for the land, catering for a large variety of interests. The location of the network of trails resulted from comprehensive input from the community and WESROC member Councils over many years.

Aboriginal sites are of immense cultural, scientific, educational and historic interest and provide Aboriginal people with an important link to their present and past culture. We acknowledge that Aboriginal and Torres Strait Islander peoples need to be part of the WESROC Greening Plan implementation.

POST-COLONIALISM

In December, 1696, three ships in the fleet commanded by de Vlamingh anchored off Rottnest Island and on 5th January, 1697, a well-armed party landed near the present-day Cottesloe Beach, marching eastward to the Swan River near Freshwater Bay. It is recorded that they tried to make contact with Noongar people to enquire about the fate of survivors of the Ridderschap van Hollant, lost in 1694, but were unsuccessful. Following this encounter, they sailed north, but not before de Vlamingh had bestowed the name Swan on the river because of the black swans he saw swimming there.

Approximately 100 years later, in 1829, Captain James Stirling founded Perth as part of the Swan River Colony. Stirling thought the natural environment around Perth was "*as beautiful as anything of this kind I had ever witnessed*" and advocated that a colony be established there. The British Government agreed to found the colony as the first free settlement in Australia, and settlers began to arrive in Western Australia in June 1829.

From there transport and communication grew slowly on the Swan Coastal Plain. The colony struggled but with steady improvement in communication and the development of Fremantle Harbour, expansion of the area occurred. The Western Suburbs became an important link between Perth and Fremantle with the help of the river, roads and railway. Towards the end of the century small settlements between Perth and Fremantle established and Claremont and Subiaco developed into major centres (Williams, 1984).

The Western Suburbs contain a high proportion of heritage listed housing that contributes a significant amount to the character of the Perth Metropolitan Area. Fortunately, a number of significant heritage trees have been protected and retained throughout the area; giving the Western Suburbs a unique greenscape. Some localities have been predominantly planted with one type of species. The Norfolk Island Pines that dominate the landscape of Cottesloe provide a unique sense of place and are an important visual link to the history of the area. Furthermore, large areas have been retained as natural bushland for biodiversity and recreational purposes, such as Bold Park.

Development and population increases within the area have resulted in a number of challenges affecting the environment.

The Perth and Peel regions are expected to accommodate an additional 1.5 million people by 2050, bringing the area's total population to more than 3.5 million.

Whether that population growth is reached sooner – or later – it is incumbent on the present generation to lay the foundations for that growth to occur without further compromising our environment, both for its intrinsic value and because of the value it has to the health and wellbeing of the community.

Perth and Peel @ 3.5 million Environmental impacts, risks and remedies , Environmental Protection Authority, 2015

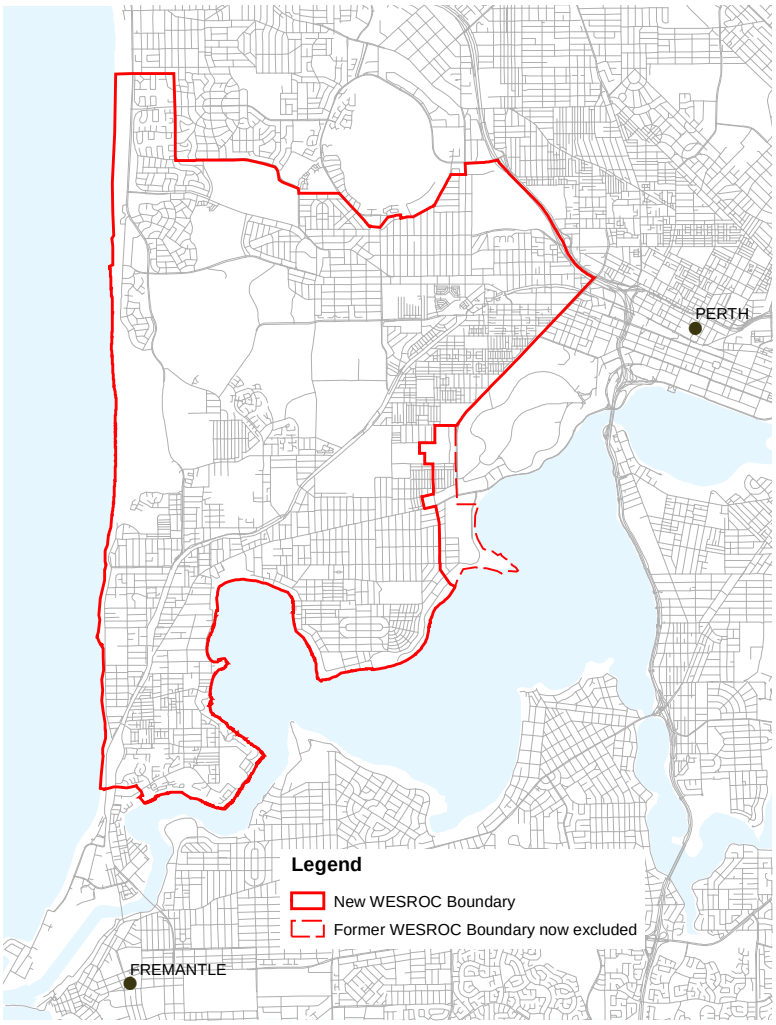
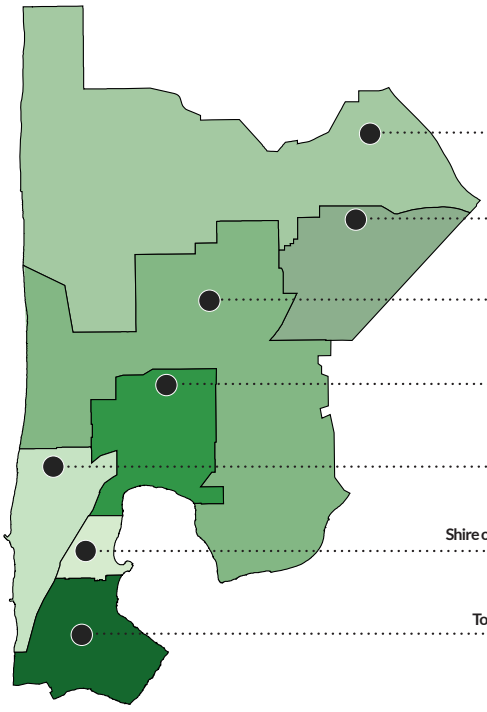


Figure 2: Western Suburbs

Image: John Street Cottesloe | Nicole Croudace



	1996	2001	2016	% POP INCREASE	POP/HA
Town of Cambridge 2,186 Ha	22,904	23,967	28,481	+24.3%	13.03
City of Subiaco 560 Ha	15,076	15,928	17,106	+13.5%	30.55
City of Nedlands 1,960 Ha	20,876	21,630	21,121	+1.2%	10.78
Town of Claremont 497 Ha	8,805	9,531	10,054	+14.2%	20.25
Town of Cottesloe 387 Ha	7,100	7,470	7,597	+7.0%	19.62
Shire of Peppermint Grove 106 Ha	1,628	1,757	1,636	+0.5%	15.40
Town of Mosman Park 429 Ha	7,420	8,241	8,757	+18.0%	20.40
WESROC 6,125Ha	**83,809**	**88,524**	**94,752**	**+13.1%**	**15.47**

Figure 3: Population Statistics

Image: Western Suburbs | Julian Croudace

WESTERN SUBURBS

The Western Suburbs are located between Perth and Fremantle as shown in Figure 2 . WESROC consistes of six member Councils of the Towns of Claremont, Cottesloe and Mosman Park, the Cities of Nedlands and Subiaco, and the Shire of Peppermint Grove and a partnership with the Town of Cambridge. They stretch from the coast to the river and have a total area of 6,125 Ha. Since 2002, the boundary of WESROC has changed due to an alignment change to the City of Subiaco and the City of Perth renegotiating the local government boundary. Figure 2 identifies the 2002 boundary and the revised boundary.

Overall, the WESROC population has increased 13.1% since the 1996 figures partly due to new high density developments and subdivisions as shown in Figure 3.

Figure 4 Land Use Plan provides an overview of the various land use types within each of the local government areas. Below is a summary the general land use categories per member local government area.

Town of Cambridge

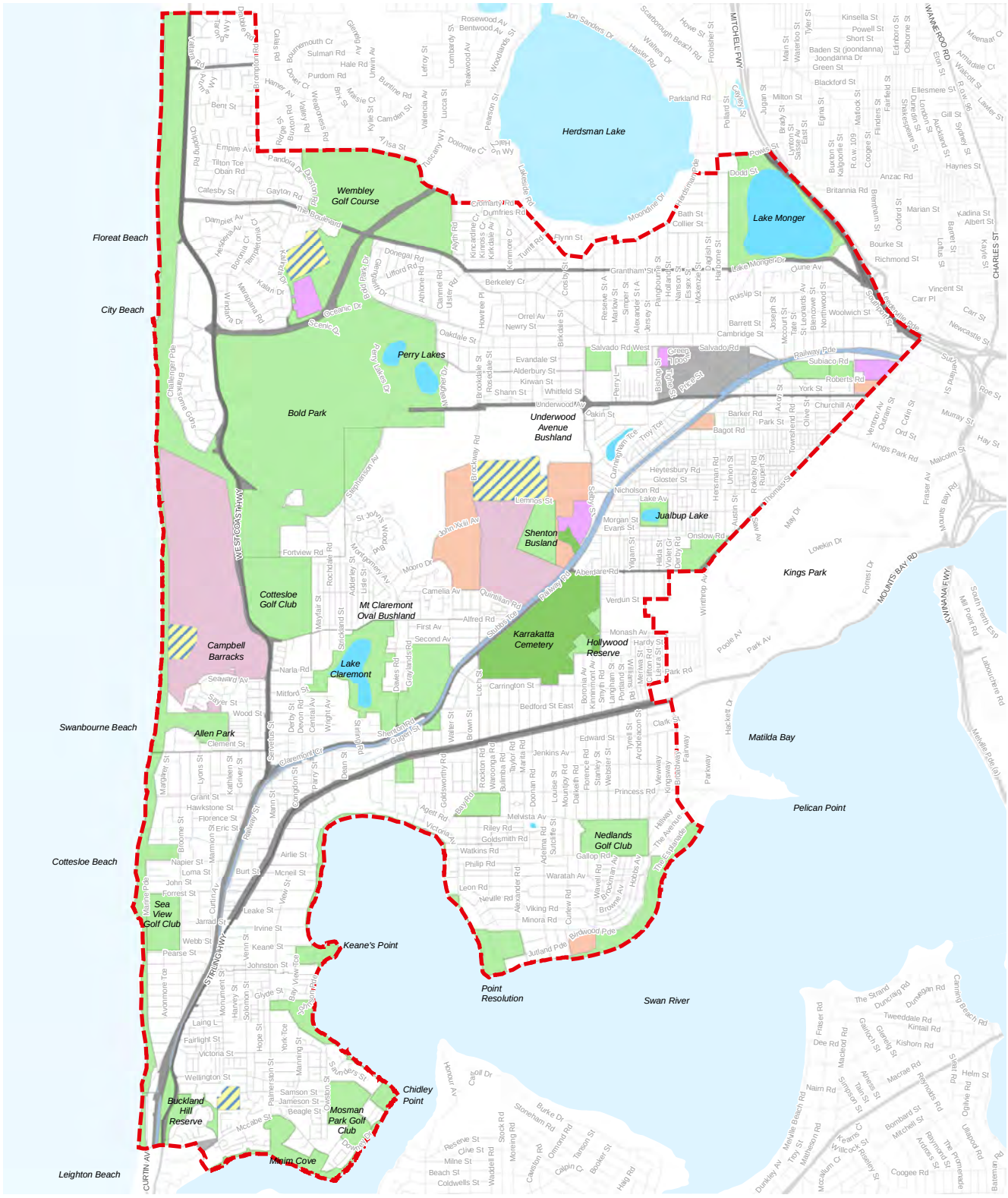
- 38 % - Parks & Recreation & Parks & Recreation (Restricted)
- 5% - Primary Regional Roads, Other Regional Roads & Railways
- 1% - Public Purposes (Commonwealth Govt., High School & WAWA)
- 56% - Urban & Urban Deferred
- 0.3% - Waterways.

Town of Claremont

- 22% - Parks & Recreation & Parks & Recreation (Restricted)
- 7% - Primary Regional Roads, Other Regional Roads & Railways
- 70% - Urban
- 1% - Waterways.

Town of Cottesloe

- 15% - Parks & Recreation & Parks & Recreation (Restricted)
- 9% - Primary Regional Roads & Railways
- 75% - Urban
- 0.5% - Waterways.



N 0 0.5 1 km

LEGEND

- WESROC Boundary
- **Metropolitan Region Scheme (WAPC, 2002)**
- Industrial
- Parks & Recreation; Open Space
- Primary and Other Regional Roads
- Railways
- Public Purposes (Commonwealth Govt.)
- Public Purposes (Education)
- Public Purposes (Hospital)
- Public Purposes (Cemetery)
- Public Purposes (Water Corporation)
- Urban
- Waterways
- Waterbodies

Figure 4: Land Use Plan

Town of Mosman Park

- 21% - Parks & Recreation & Parks & Recreation (Restricted)
- 0.5% - Industrial
- 3% - Primary Regional Roads & Railways
- 1% - Public Purposes (WAWA)
- 74% - Urban.

City of Nedlands

- 12% - Parks & Recreation & Parks & Recreation (Restricted)
- 3% - Primary Regional Roads , Other Regional Roads & Railways
- 26% - Public Purposes (Commonwealth Govt., High School, Hospital, Special Uses & WAWA)
- 59% - Urban.

Shire of Peppermint Grove

- 10% - Parks & Recreation
- 5% - Primary Regional Roads & Railways
- 85% - Urban.

City of Subiaco

- 6% - Parks & Recreation & Parks & Recreation (Restricted)
- 9% - Industrial
- 6% - Other Regional Roads & Railways
- 3% - Public Purposes (High School, Hospital & Technical School)
- 75% - Urban.

There is good potential within the Western Suburbs to increase the biodiversity of the area through improving the quality of existing bushland and wetlands, as well as through the creation of new areas and increasing the networks between the different areas. Without a strong action towards conserving and managing existing bushland and regenerated bushland; these environmental values are threatened by the impact of human activities and urban living. Statistics relating to canopy cover are detailed on in Figure 5 Canopy Cover Statistics, the information has been sourced from the STATISTICAL REPORT – The Urban Canopy of Perth and Peel. This summary identifies the clear progression of increased canopy cover in open space, roadways as well as street blocks, however it does highlight an alarming trend in canopy reduction on development site.

	Town of Cambridge	City of Subiaco	City of Nedlands	Town of Cottesloe	Town of Claremont	Shire of Peppermint Grove	Town of Mosman Park	WESROC
PARKS								
2009	18%	24%	15%	4%	11%	20%	13%	**15%**
2016	24%	31%	21%	6%	14%	21%	16%	**19%**
% CHANGE	+4.3%	+9.5%	+4.9%	+1.6%	+4.6%	+0.3%	+3.1%	**+4%**
ROADS								
2009	13%	20%	18%	12%	18%	22%	11%	**16%**
2016	18%	27%	24%	17%	24%	22%	15%	**21%**
% CHANGE	+3.9%	+8.0%	+6.9%	+5.2%	+6.9%	-0.1%	+3.3%	**+3%**
STREET BLOCKS								
2009	13%	15%	16%	12%	15%	19%	13%	**15%**
2016	16%	19%	19%	15%	18%	23%	16%	**18%**
% CHANGE	+1.6%	+3.5%	+3.6%	+3.0%	+2.6%	+3.9%	+2.6%	**+3%**
DEVELOPMENT LOTS								
2009	13%	13%	15%	10%	23%	14%	9%	**14%**
2016	5%	6%	7%	6%	10%	15%	6%	**8%**
% CHANGE	-58%	-53%	-53%	-45%	-70%	+20%	-28%	**-43%**

Figure 5: Canopy Cover Statistics

BIOPHYSICAL CONTEXT

Geomorphology

WESROC consists of two major relic dune systems; the Spearwood Dunes System and Quindalup Dune System.

The Spearwood Dune System covers approximately 95% of the study area and consists of a core of aeolinite with a hard capping of secondary calcite overlain by a variable depth of sand (W.M. McAuthur, 1991). This dune system is characterised by limestone capped peaks such as Reabold Hill in Bold Park. The wetlands of the Spearwood dunes are associated with peats and carbonate sands and occasionally clays overlaying sands. Most of the wetlands in the study area occur on this system.

The youngest landform in the area is the Quindalup Dune System consisting of steep parabolic dunes extending approximately 2.5km inland, west of and between Perry Lakes and Lake Claremont and covers 3% of the study area. The steep profile and exposure to winds make it vulnerable to erosion if the fragile vegetation cover is lost.

The Herdsman Association covers 1.5% of the study area confined to Lake Monger and consists of Peats and allied organic soils.

A small portion of Vasse Association covers 0.5% of the study area and consists of estuarine deposits of very recent origin. It is usually very wet and naturally fertile.

Landform & Soils

The information in this section is derived from the environmental geology maps of Gozzard (1983a; 1983b) and Geological Survey of Western Australia (1977).

The Western Suburbs lie within four major geological units:

- Swamp Deposits (Holocene)
- Safety Bay Sand
- Sand derived from Tamala Limestone
- Tamala Limestone.

These units are described in the following paragraphs, with reference to the geomorphic setting in which they occur.

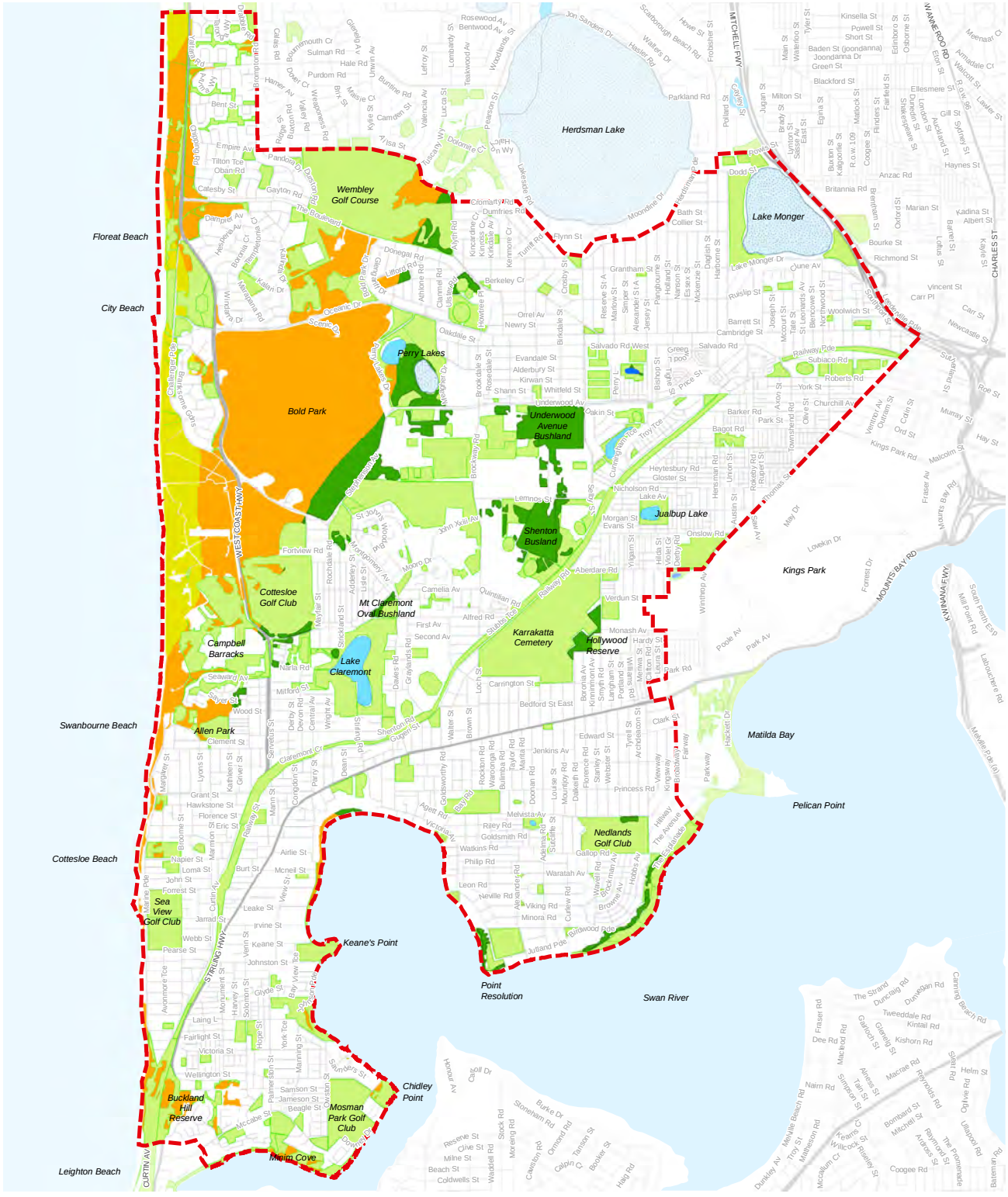
The Spearwood Dune system in the study area consists of underlying Pleistocene Tamala Limestone (map unit LS1 of Gozzard, 1986), though is mainly concealed by overlying Late Pleistocene regolith of pale and olive yellow sand (map unit S7 of Gozzard, 1986). This layer consists of medium to coarse grained, sub-angular to sub-rounded quartz and a trace of feldspar, moderately sorted, and of residual origin formed by the decomposition of the underlying Tamala Limestone. There are two associated soils of the Spearwood system; the western zone, the Cottesloe Association and immediately to the east, the Karrakatta Association. The Cottesloe Association consists of shallow yellow-brown sands and exposed limestone, while the Karrakatta Association to the east has deep yellow-brown sands (Churchward and McArthur, 1980).

Also located within the Spearwood Dune System are small areas of Holocene peaty clay (map unit Cps of Gozzard, 1986) occuring at Perry Lakes, Lake Claremont, Mason Gardens and Queen Elizabeth II Medical Centre. The Association consists of dark grey and black clay with variable sand content, and is of Lacustrine origin.

A strip of Early Holocene alluvium (map unit S14 of Gozzard, 1986) in the Vasse Association, 150m wide along the Nedlands foreshore consists of pale grey to white, well sorted, medium grained, subangular, quartz and feldspar with abundant whole and broken bivalves and gastropod shells.

Two units of calcareous sand comprise the Holocene Safety Bay Sand (map units S1 and S2 of Gozzard, 1986). The formation typically forms shoreline deposits and parabolic aeolian dunes corresponding to the Quindalup Dune System. The sands are white, fine to medium grained, sub-rounded quartz and shell debris of aeolian origin. The S1 unit is the poorly vegetated foredune next to the shore, forming a zone between 150 – 300m wide, extending from Cottesloe Beach to Trigg Island. The S2 unit extends up to 2.5km inland between Perry Lakes and Lake Claremont. Large areas of mainly open space which enclose the S2 unit are Allen Park, Swanbourne Rifle Range and Cottesloe Golf Course.

Image: Perry Lakes | Leela Day



N 0 0.5 1 km

LEGEND

WESROC Boundary

Swan Coastal Plain Wetlands (DBCA, 2016)

- Lake
- Artificial Lake
- Sumpland
- Open Space (not bushland)

Remnant Vegetation (DPIRD, 2016)

- Cottesloe Complex-Central and South: Mosaic of woodland of Tuart, Jarrah, Marri and closed heath on the Limestone outcrops.
- Herdsman Complex: Sedgelands and fringing woodland of Flooded Gum and Melaleuca species.
- Karrakatta Complex-Central and South: Predominantly open forest of Tuart, Jarrah and Marri and woodland of Jarrah and Banksia species.
- Quindalup Complex: Coastal dune complex.

Fauna Habitat

Remnant vegetation and wetlands contributute to fauna habitat.

Tree canopy along corridors and in public open space also contribute to wildlife corridors.

Figure 6: Biological Environment Plan

Image: Lake Claremont | Sally Wallace

Wetlands

Wetlands in the western suburbs occur in the Spearwood system, near the boundary between the Karrakatta and Cottesloe Associations. The wetlands in the area have been affected by European settlement showing influences from a range of land uses. Many of the wetlands have been filled or drained. The large wetland of Lake Monger is described geologically as a marsh in a low-level interbarrier depression, while the smaller wetlands such as Claremont and Jualbup Lake are described as swamps in interdunal swales (Gozzard, 1986). All of the wetlands in the area have significant social value and are also important refuges for waterbirds.

The study area contains the following wetland habitats:

- Lake Monger
- Perry Lakes
- Jualbup Lake
- Lake Claremont
- Mabel Talbot Lake.

Lake Monger is completely surrounded by urban development, being surrounded on two sides by residential development and on its third by the Mitchell Freeway. It has become very important in the urban landscape and receives heavy use for passive recreation with some active uses on the west. The only original vegetation that remains are a few sedges around the lake margins, most of the lake being surrounded by lawns and exotic trees. A small island in the south-west supports Typha and sedges. The lake has minimal habitat diversity compared to Lake Claremont and Perry Lakes but supports very large numbers of birds and is an important drought refuge.

Perry Lakes are situated in interdunal swales east of the high coastal dunes of Bold Park. The eastern swamps have been shaped to provide areas of open water in the open space around Perry Lakes Stadium . A third small seasonal wetland called Camel Lake to the west has been less modified. Perry Lakes Open Space is well used parkland thus has large social value as well as functioning as infiltration basins for storm water received from the surrounding residential area. Since 2002, Perry Lakes has been developed with medium density residential development on the fringe of the wetland environment.

Jualbup Lake is the more northerly of two small areas of swamp deposits in a shallow valley below 15m AHD which extends north from Matilda Bay on the western side of Kings Park. The Lake is a compensating basin in the main drainage system of Hollywood and Shenton Park and is linked to the main drain network of West Perth, Leederville, Subiaco, Daglish and Perry Lake.

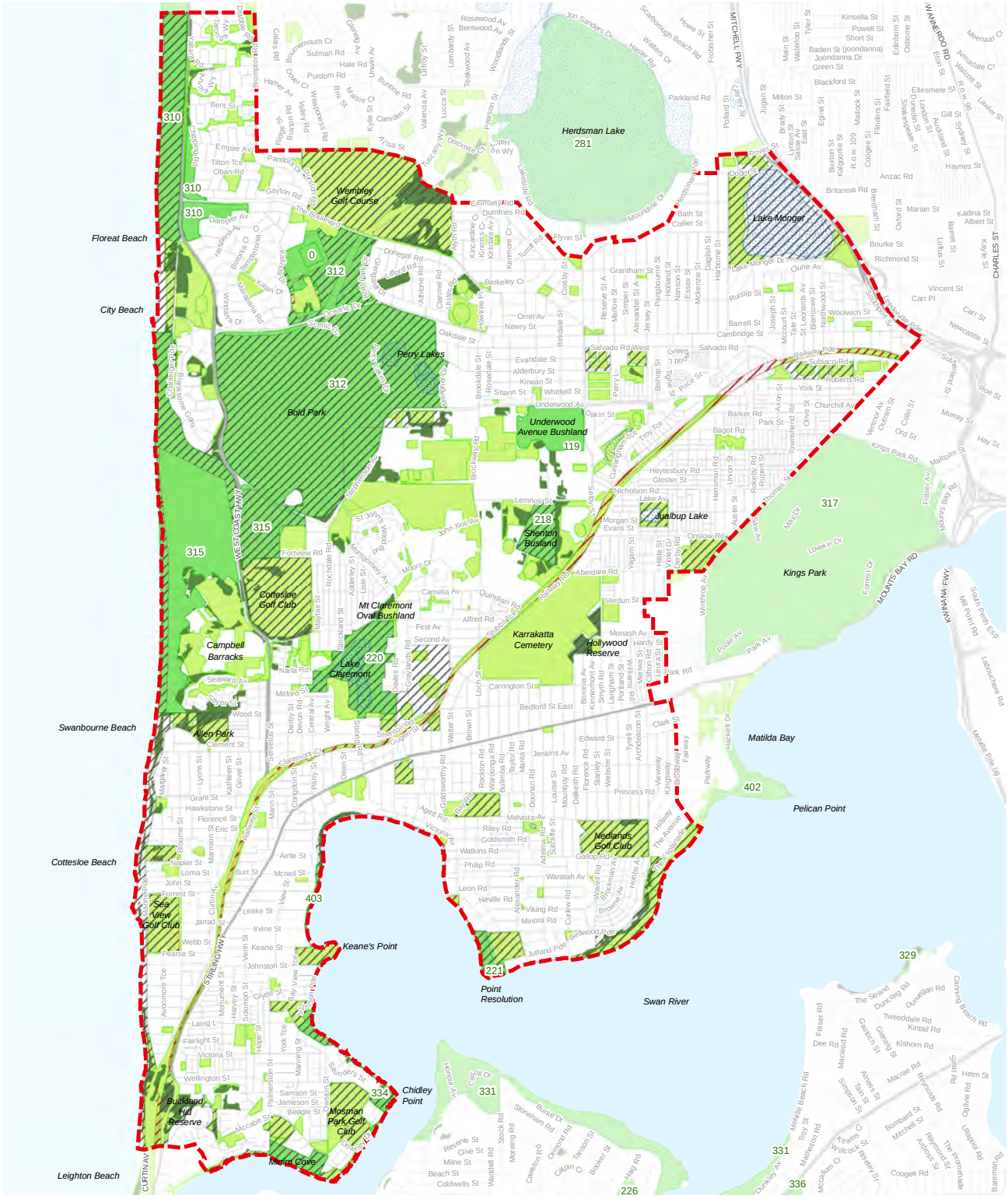
Lake Claremont is in an interdunal depression in the Spearwood Dune System, within the Karrakatta Association, close to the interface with the Cottesloe Association. Land on the south and south-west of the lake is used for playing fields with commercial uses on the south-east. There is a limited area of tuart woodland on the north and north-west of the lake. Similar to Perry Lakes, the northwestern fringe of Lake Claremont has been developed for residential land use, resulting in clearing of natural vegetation.

Mabel Talbot Lake functions as a small drainage wetland with landscaped surroundings. (Source: Arnold, 1990)

Cultural & Landscape Qualities of the Swan River

Riparian and estuarine landscapes are essential places in our biophysical, visual and cultural experience. Our recognition of a river as being a pleasant or important place to be, is a first step in planning how it can be preserved and managed for the enjoyment of all people. WESROC is bounded by the Swan River to the East and the Indian Ocean to the West.

The Swan River Estuary and its tributaries are integral to Perth's cultural and environmental identity. The river system has a natural beauty which must be preserved and managed for the enjoyment of all West Australians, as well as for visitors to our State. The Swan River System Landscape Description prepared in 1997 was the first step towards achieving landscape protection. Initial work divided the river system into 23 precincts; providing a description of each in terms of dominant landscape features, viewscapes and important elements in the environment. The aim is to use these descriptions to guide the community, government, and individual landowners in making sound management planning decisions about the river environment. Aiming to cater for a range of uses and diverse values and to promote sustainability in the management of the landscape.



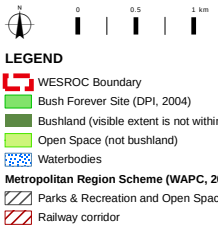


Figure 7: Bush Forever Plan

The guideline suggests in the past, natural resource planners often considered the river environment as a combination of components and processes, without detailed consideration of the aesthetics or cultural associations of the landscape and significance of the river setting for the community.

Bush Forever Sites

Bush Forever is a plan that is designed to protect the biodiversity on the swan coastal plain (Government of Western Australia, 2000b). The Bush Forever Policy (State Planning Policy 2.8) was adopted in June 2010, the key objectives of this policy are to:

- Establish a regional conservation system that is comprehensive, adeauate and representative of the ecological communities of the Swan Coastal Plain of the Perth Metropolitan Region.
- Protect and manage significant bushland through a range of mechanisms and share responsibility
- Provide an implementation framework for significant bushland areas recommended for protection and management to assist conservation planning and decision making (WAPC, 2010).

There are 495 sites across the metropolitan region that a represent 26 vegetation types (Urban Bushland Council, 2020). Within WESROC there are 10 Bush Forever sites that correspond with bushland and wetland areas, these are:

- 119 Underwood Avenue Bushland, Shenton Park
- 218 Shenton Bushland, Shenton Park
- 220 Lake Claremont, Claremont/Swanbourne
- 221 Point Resolution Reserve, Dalkeith
- 310 Floreat Beach Bushland, City Beach/Scarborough
- 312 Bold Park and Adjacent Bushland, City Beach
- 315 Swanbourne Bushland, Swanbourne/City Beach
- 334 Chidley Point and Adjacent Bushland, Mosman Park
- 335 Minim Cove, Mosman Park
- 403 Peppermint Grove Foreshore, Peppermint Grove.

Bushland

In 2002 the bushland covered 12% (785 Ha) of WESROC. The Bushland has increased to 14% (854 Ha) resulting in no net loss of bushland within WESROC. The largest portions of bushland are contained in Bold Park (324 Ha) and Swanbourne Bushland (92 Ha) in the western region of the Western Suburbs. The Western Suburbs contained five vegetation complexes prior to clearing, as described by Heddle et al. (1980), with 4 complexes left in remaining remnant bushland. These vegetation complexes correspond to major landforms and soil types defined by Churchward and McArthur (1980), and are recognised in Bush Forever (Government of Western Australia, 2000b). The five vegetation complexes are:

- Karrakatta Complex – Central and South
- Cottesloe Complex – Central and South
- Herdsman Complex (no longer present)
- Quindalup Complex
- Vasse Complex (small portion).

The distribution of the remaining vegetation complexes within the Western Suburbs and land reserved for parks recreation and open space based on Town Planning Schemes is shown in Figure 5.

A brief description of each of the five complexes, based on Heddle et al. (1980) is provided in Table 1.

Classification of Vegetation Density

An important aspect of developing the Greening Plan was to determine the distribution of vegetation density levels within the Western Suburbs. This enabled the identification of areas with potential for rehabilitation and thus greenway establishment. Vegetation density was divided into the following categories:

- Bushland (high density)
- Parkland/Golf Courses (medium density)
- Grassland and Ovals (low density).

Most of the green spaces in the Western Suburbs are fragmented, however large bushland areas are found within or adjoining the Western Suburbs such as Bold Park and Kings Park. A desktop review has identified over 33% of the WESROC is classified as open space with a Vegetation Classification Density (VCD) of high, medium or low density.

- 13.9% is classified as High Density. A High VCD could be described as coastal dunes and foreshore areas, Buckland Hill Reserve, Bold Park, Perry Lakes, Underwood Avenue Bushland, Shenton Bushland and Hollywood Reserve.
- 12.5% is classified as Medium Density. A Medium VCD could be described as Railway corridor or sporting ovals.
- 6.4% is classified as Low Density. A Low VCD could be described as parklands, golf courses and Karrakatta Cemetery.

A further comparison of VCD and Land Use has identified:

- 67% of bushland within High Density is on land reserved as Parks and Recreation
- 17% of bushland within High Density occurs on land that is for Public Purposes, the majority (14%) being on Campbell Barracks.
- 12.5% of bushland within High Density occurs on unprotected tenure (urban)
- 55% of Medium Density open space occurs on land reserves for Parks and Recreation
- 18.5% of Medium Density open space occurs on land that is for Public Purposes
- 3% of Medium Density open space occurs on 'urban' tenure
- 26% of Low Density open space occurs on land reserves for Parks and Recreation
- 17% of Low Density open space occurs on land that is for Public Purposes
- 41% of Low Density open space occurs on 'urban' tenure.

Figure 8 shows the distribution of vegetation density levels in the Western Suburbs.

Table 1: Vegetation Complexes

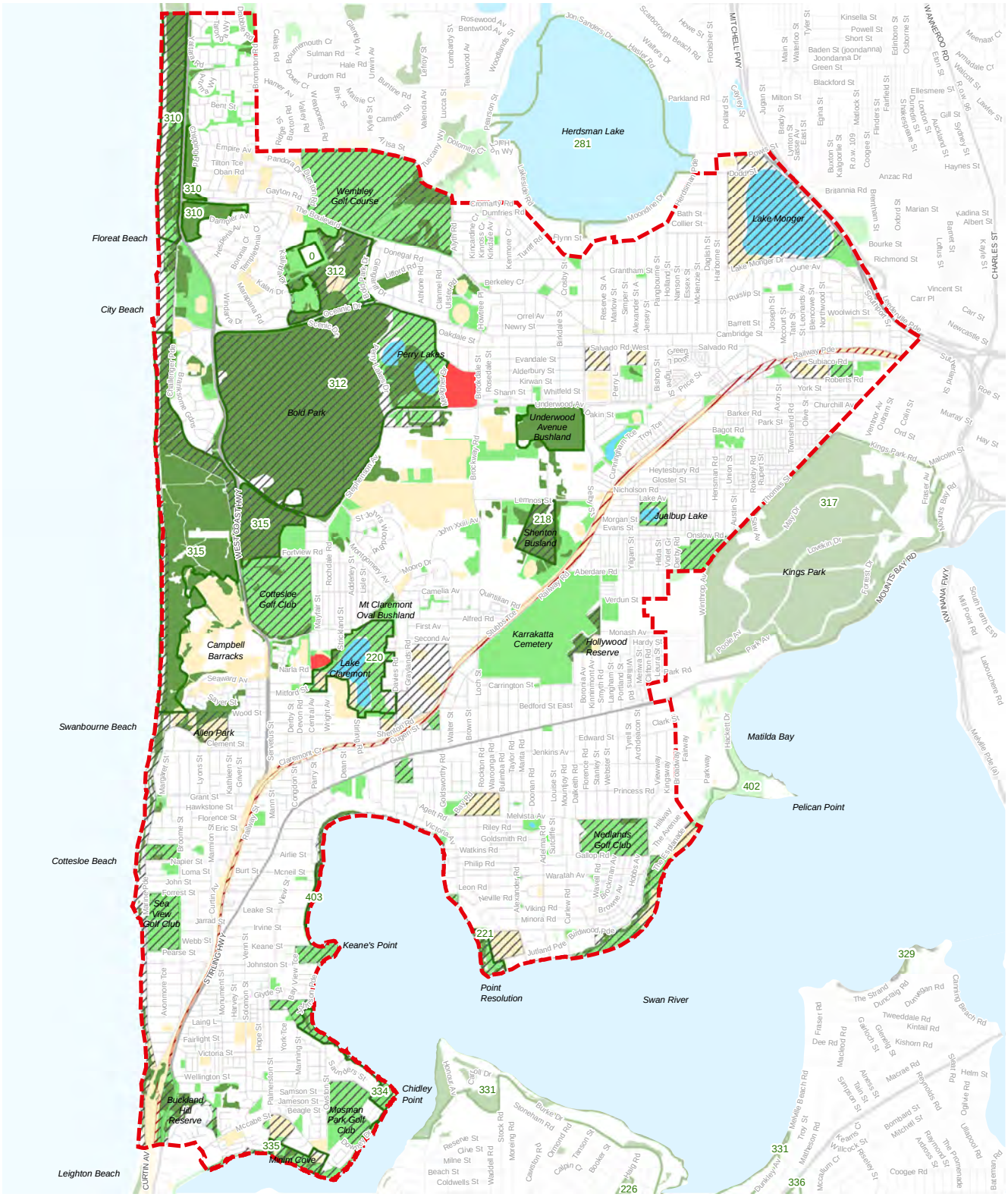
LANDFORM UNIT	**Quindalup Dunes |** Quindalup Complex	**Spearwood Dunes |** Cottesloe Complex	**Spearwood Dunes |** Karrakatta Complex	**Spearwood Dunes |** Herdsman Complex
Vegetation Complex	Quindalup Complex	Cottesloe Complex – Central and South	Karrakatta Complex – Central and South	Herdsman Complex
Vegetation Description	Restricted to the coastal dunes and encompasses the characteristic strand vegetation of spinifex, *Cakile*, *Carpobrotus* to stable dune communities of *Acacia*, *Myoporum* and *Spyridium*.	Supports heaths on limestone outcrops, with deeper sands supporting a mosaic of woodlands of tuart mixed with open forest of *Tuart-Jarrah-Marri*.	Predominantly open forest of *Eucalyptus gomphocephala*, *E. marginata*, *E. todtiana*; closed heath on limestone outcrops.	Sedgelands and fringing woodland of E*ucalyptus rudis*, *Melaleuca* species.
Examples	Western section of Swanbourne bushland.	The majority of Bold Park (Bush Forever site No. 312), eastern section of Swanbourne bushland, Chidley Point bushland and Peppermint Grove foreshore.	Includes Shenton Bushland (Bush Forever site No. 218), Underwood Avenue Bushland (Bush forever site No. 119), Point Resolution Reserve (Bush Forever site No. 221), eastern section of Bold Park (Bush Forever site No. 312), Pelican Point (Bush Forever site No. 402), Birdwood Parade Reserve and Hollywood Reserve.	None
Area remaining within WESROC (2002)	99 Ha	521 Ha	165 Ha	0 Ha
Area remaining within WESROC (2019)	**115 Ha** (1.1% of the extent remaining within the MRS)	**569.24 Ha** (5.92% of the extent remaining within the MRS)	**169.28Ha** (3.94% of the extent remaining within the MRS)	**0 Ha**
Pre-European Extent on the Swan Coastal Plain (SCP)	54,5734 Ha	45,300 Ha	53,081 Ha	9,665 Ha
Area Remaining on the SCP (2019)	33,011 Ha (60.5% remaining of original extent)	14,568 Ha (32% remaining of original extent)	12,467 Ha (23.5% remaining of original extent)	3,104 Ha (32% remaining of original extent)
Area Remaining within the Metropolitan Regions Scheme (MRS) (2019)	10,413 Ha (42.5% remaining of original extent)	9,609 Ha (27.5% remaining of original extent)	4,291 Ha (12.5% remaining of original extent)	2,192 Ha (33.5% remaining of original extent)

Bushland extent: Remnant vegetation figures and statistics are derived from the 2020 remnant vegetation spatial dataset. The data has been captured using digital aerial photography from 1996-2020 and is updated annually (DPIRD, 2020). There may be some inconsistences between the 2002 and 2020 spatial datasets that have resulted in the increased bushland extent, for example groups of parkland trees may be identified as bushland. Ecoscape have not corrected the remnant vegetation layer which would require a combination of aerial interpretation and ground-truthing.

Reference: Government of Western Australia. (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Threatened Ecological Communities

Ecological communities are naturally occurring biological assemblages associated with a particular type of habitat. Threatened Ecological Communities are recognised as being at risk of extinction (DPAW, 2017). One Threatened Ecological Community (TEC) occurs within the Study Area in Mosman Park (DBCA, 2018), which is theCallitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain. This TEC is listed as vulnerable – category B which is defined as an ecological community that is vulnerable to threatening processes and is either restricted in range or only found at a few locations) (DPAW, 2017). An Interim Recovery plan for this community has been developed by DPAW (2014).



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LEGEND

- WESROC Boundary
- Bush Forever Site (DPI, 2004)
- Waterbodies

Vegetation Classification

- High Density - Bushland
- Medium Density - Parkland/Golf Course
- Low Density - Grassland/Ovals
- Developed since 2002

Metropolitan Region Scheme (WAPC, 2002)

Land Reserved For:

- Parks & Recreation and Open Space
- Railway corridor

Figure 8: Vegetation Density Plan

Threatened & Priority Flora

Conservation significant flora species are those that are listed as TF (Threatened Flora) and (within Western Australia) as PF (Priority Flora). TF species are listed as Threatened by the Western Australian DBCA and protected under the provisions of the BC Act. Some State-listed TF are provided with additional protection as they are also listed under the Commonwealth EPBC Act.

Flora are listed as PF where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to TF categories. Whilst PF are not specifically listed in the BC Act, some may qualify as being of special conservation interest and these have a greater level of protection than unlisted species.

According to the Department of Biodiversity, Conservation and Attractions (DBCA) database the following species are known to occur within or near to the Study area, as shown in Table 2.

Image: Dodonaea hackettiana | Ecoscape

Table 2: Threatened and Priority Flora species

SPECIES	STATUS[1]	FAMILY	FLOWERING PERIOD	HABIT	HABITAT
Eucalyptus x mundijongensis	P1	Myrtaceae		Tree to 25m high; bark fibrous, fissured, grey; branchlets smooth.	Loam, paddocks.
Picris compacta	Presumed exitinct	Asteraceae		Herb; 0.09-1.2m high; flowers yellow.	Loam, limestone, river banks.
Acacia benthamii	P2	Mimosaceae	Aug-Sep	Shrub to 1m high; flowers yellow.	Sand, typically on limestone breakways.
Schoenus capillifolius	P3	Cyperaceae	Oct-Nov	Semi-aquatic tufted annual sedge; 0.05m high; flowers green.	Brown mud, claypans.
Angianthus micropodioides	P3	Asteraceae	Nov-Feb	Erect or decumbent annual herb; 0.03-0.15m high; flowers yellow, white.	Saline sandy soils, river edges, saline depressions, claypans.
Aotus cordifolia	Not threatened (formerly P3)	Papilionaceae	Aug-Jan	Erect or straggling shrub; 0.3-1.5m high; flowers yellow.	Peaty soils, swamps.
Beyeria cinerea (Müll.Arg.) Benth. subsp. cinerea	P3	Euphorbiaceae	Aug-Nov	Open, erect shrub;0.3-0.9m high; 0.4-0.8m wide; flowers green, yellow	Sand over limestone, road verges, gullies
Hibbertia spicata	Not threatened (formerly P3)	Dipsacaceae	Jul-Nov	Shrub; 0.2-0.7m high; flowers yellow.	Sand, limestone and laterite soils, near coastal areas of limestone.
Hibbertia leptotheca (J.R.Wheeler) K.R.Thiele	P3	Dipsacaceae	Jul-Oct	Erect or spreading shrub; 0.2-0.5m high; flowers yellow.	Sand, near coastal limestone ridges, outcrops and cliffs.
Jacksonia sericea	P4	Papilionaceae	Dec-Feb	Spreading shrub to 0.6 m. Flowers orange.	Calcareous and sandy soils.
Lambertia multiflora	Not threatened (formerly P3)				
Dodonaea hackettiana	P4	Sapindaceae	Jul-Oct	Shrub or tree 1-5 m. Flowers yellow, green, red.	Sand, outcropping limestone.
Calytrix sylvana	Not threatened (formerly P4)	Myrtaceae	Dec-Mar	Shrub; 0.3-1m high; flowers purple.	Sand, near lakes.
Grevillea thelemanniana	Threatened	Proteaceae	May-Nov	Spreading shrub 0.3-1.5m. Flowers pink, red.	Sand, sandy clay, and winter-wet low-lying flats.

Notes: 1. The definitions of the Conservation codes for Western Australian flora and fauna (DBCA 2019)

Fauna

Bold Park's tuart-banksia woodlands and limestone heaths support a range of fauna habitats. Three mammal species occur in Bold Park, the common brushtail possum (*Trichosurus vulpecula*) and two bat species, the white-striped mastiff bat (*Tadorida australis*) and Gould's wattled bat (*Chalinolobus gouldii*). Additionally, there are 28 reptile species found within the Park, including the rare and endangered black striped snake (*Vermicella colonotus*). Three frog species have been recorded by the BPGA, including the banjo frog (*Limnodynastes dorsalis*), moaning frog (*Heleioporus eyrei*) and turtle frog (*Myobatrachus gouldii*). The Park has a rich avifauna with 91 bird species recorded, including vagrants, migrants and nomadic species that are likely to occur sporadically. (bgpa.wa.gov.au/bold-park/visit/biodiversity)

According to the City of Subiaco's Wildlife Enhancement Plan 2014-2019, they have the same three mammals as Bold Park as well as a diverse number of water birds, reptiles, amphibians, fish and aquatic macro-invertebrates. Swanbourne Bushland contains significant populations of insectivorous passerine birds including Splendid, Variegated and White-winged Fairy-wrens and White-browed Scrubwren (Bush Forever, 2000).

In general, frogs and small reptile species, particularly skinks and bobtails, display an ability to persist in urban bushland remnants. Frogs such as the Banjo Frog (*Limnodynastes dorsalis*) and Moaning Frog (*Heleioporus eyrei*) are usually found in bushland areas in close proximity to wetlands.

Small bird species such as fairy-wrens, scrub-wrens and thornbills tend to disappear from urban bushland as they require a large area to support a viable population, they are vulnerable to predation by cats, and they generally do not traverse through unfavourable habitat. Consequently, they are unable to recolonise isolated bushland remnants. Larger bird species such as many honeyeaters and parrots are able to utilise bushland remnants, as they are able to fly over urban areas. Birds such as the Australian magpie, Australian raven and the introduced rainbow lorikeet thrive in the urban environment.

There are several species of feral animal within the western suburbs, as well as domestic cats and dogs. Bold Park is also used for horse exercising. Cats are the most likely invader from urban areas. Known vertebrate feral animal species are:

- *Felis catus*, Cat
- *Vulpes vulpes*, European Red Fox
- *Oryctolagus cuniculus*, Rabbit
- *Canis familiaris*, Domestic Dog
- *Mus musculus*, House Mouse
- *Rattus rattus*, Black Rat
- *Columba livia*, Rock Dove or Feral Pigeon
- *Streptopelia senegalensis*, Laughing Turtle Dove
- *Dacelo novaeguineae*, Laughing Kookaburra
- *Cacatua rosecapilla*, Galah
- *Lepus curpaeums*, Rabbit
- *Cacatua tenuirostris*, Long-billed corella
- *Trichoglossus haematodus*, Rainbow lorikeets.

The feral rodents, the House Mouse and Black Rat, are ubiquitous species commonly associated with human settlement and are difficult to control in bushland areas.

Image: Calyptorhynchus latirostris (Carnaby's Black Cockatoo) | Sally Wallace

Image: Limnodynastes dorsalis (Banjo Frog) | Jordan Vos

LANDSCAPE CHARACTER TYPES

The andscape Character Types for this area comprise of broad scale residential and commercial/light industrial areas and natural landforms and water bodies. The following character types are based on the inventory of the physical landscape and its overall appearance. The total visual character is the collective assessment of landform, climate, vegetation, waterform, and the cultural and land-use patterns. The Western Suburbs can be divided into predominantly 4 different Landscape Character Types across the site as shown in Figure 9 and described below.

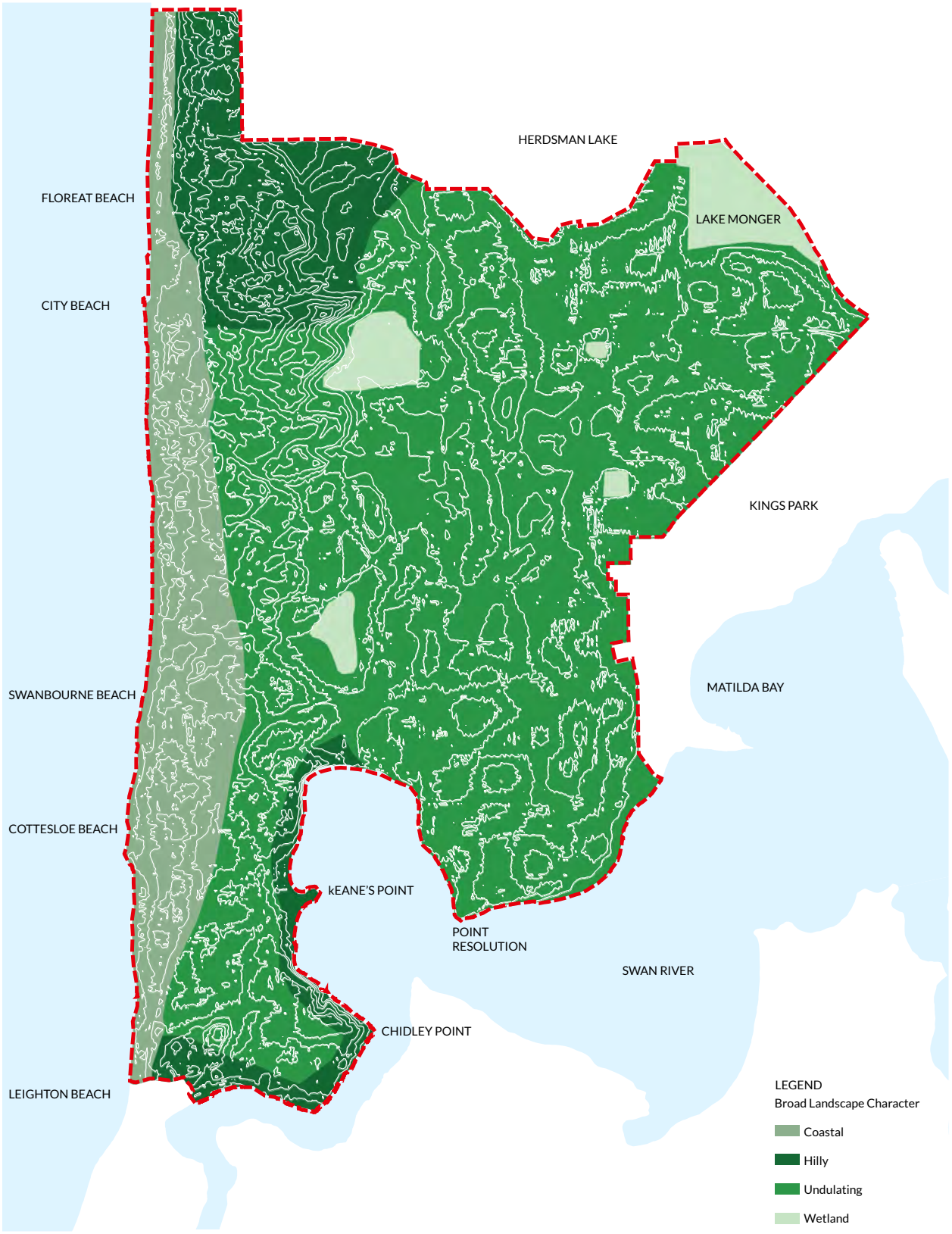


Figure 9: Landscape Character Plan

#1 | Coastal zone

Landscape Characteristics

Long narrow zone from the western edge of the Indian Ocean to Marine Parade of Cottesloe and along the West Coast Highway to Wembley Downs.

Soil Type

Quindalup Dunal System with some exposed limestone.

Visual Characteristic

White sandy beaches, low growing pale green and olive green scrubby vegetation, some creamy-grey exposed limestone outcrops.

Dark grey bitumen of access roads and various colours of the rooflines of residential areas.

Landuse

Predominantly recreational use, of the beaches and sand dune area. Some high-density residential use along the Cottesloe area and Governmental Defence use along the Swanbourne area.

Image: Cottesloe | Nicole Croudace

#2 | Isolated low lying freshwater lakes swamps

Landscape Characteristics

Several isolated areas across the site.

Soil Type

These areas consist of grey/black sands of the Spearwood Dune System.

Visual Characteristic

Pale blue of shallower lakes to darker green water of slow moving low lying wetland and circular lakes.

Vegetation is generally of Flooded Gum Melaleuca species and several areas of wetland grasses and rushes.

Landuse

Several watercourses and waterbodies, such as Perry Lakes, Lake Claremont, Lake Monger, Shenton Park and parts of Bold Park.

Perimeter of parts of the Swan River and the coastal zone of the Indian Ocean.

Image: Lake Monger | Sally Wallace

#3 | Undulating landscapes

Landscape Characteristics

Gentle rolling flat to gently inclined plains and rounded foothills.

Soil Type

The area between the dunal landforms and the Swan River consist of Spearwood sands which are divided into Karrakatta soils and Cottesloe sands The Karrakatta soils are limestone and have deep limestone deposits.

The Cottesloe sands on the western side of Karrakatta are, brown to yellow on the surface with surface limestone, exposed at several places.

Visual Characteristic

Corridors and large areas of grey-green vegetation varying from natural Jarrah/Marri woodland to the darker green of street trees and public open space comprising of predominantly non-indigenous species and grassy areas.

Some areas of green open grassland consist of golf courses and public parks.

Dense grey roofed and red brick buildings of large commercial and light industrial activities occur in Shenton Park, Osborne Park and Cottesloe/Nedlands.

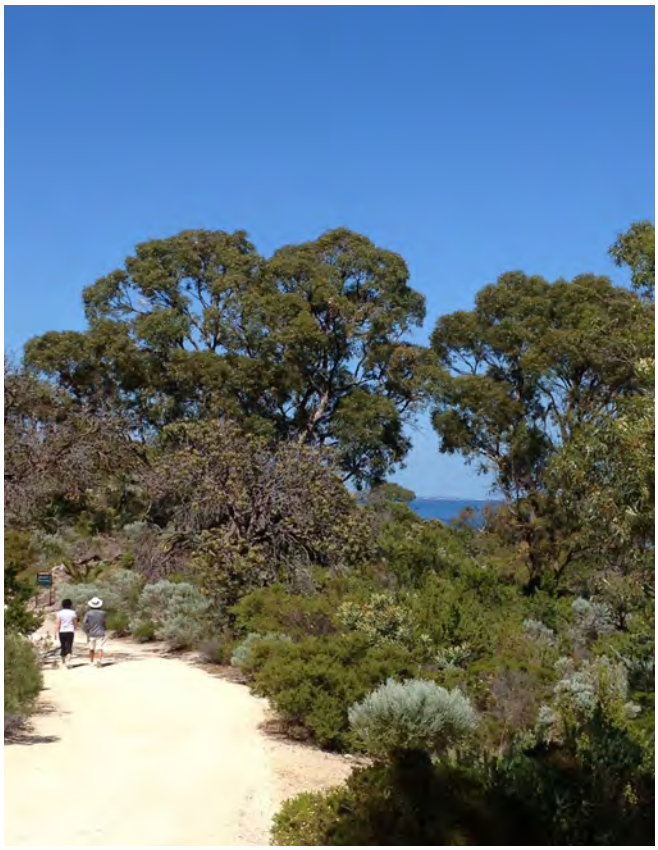


Image: Bold Park Zamia Trail | Sally Wallace

#4 | Hilly landscapes

Landscape Characteristics

Remnant hills and limestone outcrops and larger inland dunes.

Soil Type

Areas characterised by grey to brown sands of the Spearwood Dune System with relatively high relief. Soft yellow to rich toffee coloured sand. Rough limestone outcrops exposed in some places.

Visual Characteristic

Dense grey green vegetation that form parts of Monument Hill and the Reabold Hill/ Bold Park area. Darker green of street trees and residential areas. Native vegetation of Reabold Hill and Bold Park.

Pale cream to darker grey of the exposed limestone outcrops and cliff faces. Grey bitumen or the main roadways and grey to silver of rooftops of commercial and light industrial buildings. Predominantly red and brown tiled roofs of the residential areas.

Landuse

Public open space along the Swan River perimeter. Residential and open areas on the remnant limestone hills of Floreat and Buckland Hill Monument Hill and Mt Claremont. Recreational areas along the Swan River foreshore. Some retail, commercial and light industrial areas. Grid patterned street layout and sub-divisions. Main feeder roads leading to side roads, Highways and railway lines.

Image: Mount Claremont | Sally Wallace

PLANNING & STRATEGIC DOCUMENTS

Strategic Planning Context

The WESROC Greening Plan contributes and aligns with the overall improvement of the environment, social and economic outcomes for the community on a regional, state, national and international level. The following summarises important strategies that identify objectives that support change.

Global

UN Sustainable Development Goals

The 2030 Agenda for Sustainable Development, is a plan of action for people, planet and prosperity. The Heads of State and Government and High Representatives, meeting at the United Nations Headquarters in New York from 25-27 September 2015 set new global Sustainable Development Goals. The Agenda aims for a collective journey to be undertaken by all countries and stakeholders, to act in a collaborative partnership which is urgently needed to shift the world onto a sustainable and resilient path. The Goals and targets will stimulate action over the next fifteen years in areas of critical importance for humanity and the planet:

» People
» Planet
» Prosperity
» Peace
» Partnership.

Of the 17 Sustainable Development Goals, the following are particularly relevant to the WESROC Greening Plan:

Goal 6. Ensure availability and sustainable management of water and sanitation for all:

» By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
» By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
» By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
» By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
» By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

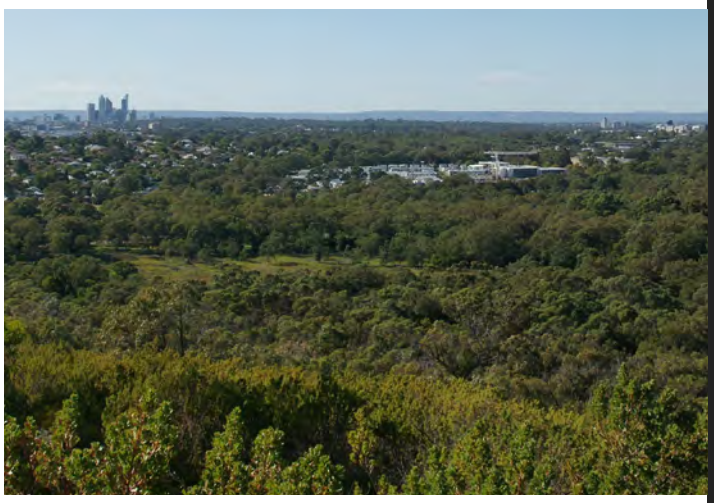


Image: Perry Lakes Development | Nicole Croudace

» Support and strengthen the participation of local communities in improving water and sanitation management

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

» By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
» Strengthen efforts to protect and safeguard the world's cultural and natural heritage
» By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
» By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
» Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

Goal 13. Take urgent action to combat climate change and its impacts

» Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
» Integrate climate change measures into national policies, strategies and planning
» Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
» Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible

Image: Tawarri Nedlands | Julian Croudace

» Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

» By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

» By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

» By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

» Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

» Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed

» Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products

» By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species

» By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

» Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

» Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation

» Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities

National

Australia's Biodiversity Conservation Strategy 2010 –2030

Australia's Biodiversity Conservation Strategy 2010–2030 presents a long-term view of a future in which:

» the importance of biodiversity to our existence is recognised and, as a consequence, consumption patterns are balanced against the imperatives of the environment;

» all Australians including Indigenous peoples, farmers, land managers, industry, governments and community groups such as Landcare are working together to conserve biodiversity;

» we have reduced the impacts of existing threats such as invasive species so that their impact on biodiversity is negligible; and

» we have managed emerging threats such as changing fire regimes, reduction in water availability and the impacts of climate change to the extent that the threat to the environment is minimised and any damage is reversed.

Biodiversity is not static; it is constantly changing. It can be increased by genetic change and evolutionary processes, and it can be reduced by threats which lead to population decline and extinction. Biodiversity in Australia is currently declining because of the impacts of a range of threats. If we continue to live unsustainably, we risk the degeneration of the ecological systems that support our life and our nation's productivity. We also risk eroding the legacy we leave future generations. Collectively we have a civic responsibility to help sustain

our living planet. Conserving biodiversity is central to living sustainably and is an essential part of safeguarding the biological life support systems on Earth.

The Priorities for action section identifies three national priorities for action to help stop the decline in Australia's biodiversity. These priorities for action are:

Engaging all Australians in biodiversity conservation through:

- mainstreaming biodiversity
- increasing Indigenous engagement
- enhancing strategic investments and partnerships.

Building ecosystem resilience in a changing climate by:

- protecting diversity
- maintaining and re-establishing ecosystem functions
- reducing threats to biodiversity.

Getting measurable results through:

- improving and sharing knowledge
- delivering conservation initiatives efficiently
- implementing robust national monitoring, reporting and evaluation.

"Western Australia's unique natural environment encompasses pristine and diverse natural areas both onshore and offshore, with world-renowned biodiversity, scenic landscapes, heritage sites, marine and coastal areas and places of cultural significance. The clean and beautiful natural environment is a major contributor to the State's liveability and attractiveness."

State Planning Strategy 2050

State

100-year Biodiversity Conservation Strategy for Western Australia

A 100-year Biodiversity Conservation Strategy for Western Australia (Draft) has been prepared in response not only to the problem of continuing decline in indigenous biodiversity, but also the opportunity we still have to protect and restore biodiversity in the State. The health and well-being of all Western Australians and future generations, and the State's economy, is dependent on our ability to reverse this decline and maintain biodiversity values. The most important general causes of biodiversity loss in WA are:

- habitat loss and modification associated with land and natural resource uses and practices;
- biophysical consequences of introduced species (plants, animals and pathogens); and
- effects of human-induced climate change.

The overall goal of the strategy is to recover and conserve WA's biodiversity within 100 years. This will require focusing on those species and ecosystems that are known to be under significant pressure from a range of factors and on the brink of extinction, while at the same time preventing decline of biodiversity in ecosystems and landscapes that are ecologically intact and in relatively good condition. This strategy will require initiatives that reach across generations and communities, and that improve knowledge and technical capacity to predict changes and determine trends in biodiversity.

Eight key strategic directions provide an overarching framework for 138 lower order primary actions to meet the strategy's goal and vision:

- Build biodiversity knowledge and improve information management
- Promote awareness and understanding of biodiversity and related conservation issues
- Engage and encourage people in biodiversity conservation management
- Improve biodiversity conservation requirements in natural resource use sectors
- Enhance effective institutional mechanisms and improve integration and coordination of biodiversity conservation
- Establish and manage the formal conservation reserve system
- Recover threatened species and ecological communities and manage other significant species/ecological communities and ecosystems
- Conserve landscapes/seascapes for biodiversity (integrating on- and off-reserve conservation and managing system-wide threats).

Image: Matilda Bay Foreshore | Nicole Croudace

The following principles are the basis for the objectives listed above and will guide their implementation:

- **Maximise investment for long-term public benefits** | Biodiversity conservation is an investment that yields substantial individual, local, regional, State, national and international benefits. Investment at a State level should be targeted to achieve the greatest benefits for the people of WA, and to bring about the greatest level of public good that will reach across generations.
- **Shared responsibility to ensure effectiveness** | All Western Australians depend on biodiversity and have a responsibility to contribute to its conservation and to use biological resources in a sustainable manner. Because biodiversity transcends institutional, administrative and political boundaries, cooperation and support are vital for effective conservation and integration of actions across organisations and jurisdictions. Biodiversity conservation in WA is also affected by national and international obligations.
- **All indigenous biodiversity values need to be conserved** | Indigenous forms of life warrant respect from humanity, irrespective of utilitarian value or whether they have an immediate benefit to humans.
- **Biodiversity is best conserved in situ** | Conservation of species where they occur (and not just in a botanic garden, zoo or laboratory) is a prerequisite for maintaining ecological and evolutionary processes. Consequently, a central pillar of biodiversity conservation is the establishment of a conservation reserve system that provides security of tenure and purpose in perpetuity, and management of other natural systems.
- **Ensure that actions are outcome-focused** | Action to conserve biodiversity must be approached with a clear focus on outcomes and be based on an adaptive management approach where research and evaluating effectiveness of actions are integral components to build effective management regimes
- **Prevention is better than cure** | Prevention of ecosystem damage and species loss is more cost-effective than attempting rehabilitation or recovery. The causes of biodiversity loss must be anticipated and acted on at the source.
- **Manage for the future, but learn from the past** | Actions need to ensure that the benefits enjoyed from biodiversity by today's generation are available or enhanced for future generations. Decision making and priority setting need to be informed by past experience and scientific knowledge.
- **Be precautionary in making decisions** | Lack of full scientific certainty should not be a hindrance to enacting management to conserve biodiversity or postponing measures to prevent environmental degradation or harm. Avoid selecting irreversible options.
- **Achieve a balance in actions** | Indigenous species (or taxa) and ecological communities close to extinction require special attention, together with strategic investment that provides for conservation of intact ecosystems and landscapes.
- **Gain understanding** | Conservation is improved by ongoing improvement in knowledge and understanding of species, populations, ecological communities, ecosystems and social-ecological systems. This will require building scientific knowledge, and ensuring recognition of indigenous and local knowledge where appropriate.

Swan Region Strategy for Natural Resource Management

The purpose of the Swan Region Strategy for Natural Resource Management, is to provide a strategic, integrated framework for natural resource management in the Swan Region of Western Australia. The natural resources of the Swan Region are protected and managed sustainably in their own right and for the enhancement of the quality of life for present and future generations. Key aspirational goals include:

- Perth is an eco-city where natural assets are valued and used sustainably
- Land use and development is sustainable and appropriate to land capability and suitability
- Residents and visitors value and enjoy access to high quality natural areas
- Aboriginal cultural heritage values are integral to the way we view and manage the environment
- Water quality (marine and freshwater) is maintained and water resources are used sustainably

Image: View south over the Western Suburbs | Julian Croudace

- » Biodiversity and ecosystem function is protected, managed and restored
- » Air is healthy for the community and the environment
- » Climate change is addressed to ensure the Swan Region remains liveable and resilient

Action Areas and Strategic Objectives include:

Leadership, Coordination and Governance

- » Work towards agreed priorities and outcomes
- » Work collaboratively
- » Apply environmental accounting approaches
- » Invest in natural assets
- » Ensure policies, legislation and standards are effective
- » Reflect Aboriginal cultural heritage values in policy and practice
- » Ensure land use planning is environmentally sensitive

Asset Protection and Sustainable Use

- » Manage assets within a landscape system
- » Address drivers, risks and threats
- » Enforce regulations and approval conditions
- » Support voluntary environmental standards
- » Transform Perth into an eco-city

Awareness, Participation and Capacity Building

- » Build community awareness and participation
- » Support environmental community groups
- » Involve the Aboriginal community
- » Build the capacity of local government
- » Enhance the environmental sustainability of businesses and organisations
- » Support environmental stewardship
- » Recognise and celebrate achievements

Knowledge, Research and Adaptive Management

- » Focus research, development and innovation on critical needs and knowledge gaps
- » Ensure essential knowledge is accessible to decision-makers
- » Integrate scientific and traditional ecological knowledge
- » Monitor and report on resource condition
- » Monitor and evaluate environmental programs

The development of this Strategy has been guided by the fundamental principles from the 2004 Strategy along with new information and thinking in natural resource management. These principles recognise the need to pursue sustainable development in the Region, and highlight the importance of partnerships and collaboration. They are primarily concerned with:

- » **Integrated Management** | The management of natural resources should be integrated within regions and catchments as well as across industry sectors, government agencies and specific issues
- » **Priority Based** | Natural resource management actions should be undertaken according to priorities that are based on the best available science and information and a rigorous assessment of cost-effectiveness and relative value compared with other options
- » **Intergenerational Equity** | The current society should meet its needs in ways to ensure that the health, diversity and productivity of the environment are maintained, without reducing the capacity of future generations to meet their needs
- » **Shared Responsibility** | Everyone, including government, industry, business and the wider community play a vital role in protecting and managing the Region's natural assets
- » **Partnerships** | Effective natural resource management requires partnerships across government, non-government organisations, community, business and industry to achieve large scale, lasting change
- » **The Precautionary Principle** | Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- » **Prevention is Better than Cure** | Protecting natural systems from damage is far more cost- effective than attempting rehabilitation once the damage is done, as some biodiversity assets once lost can never be recovered
- » **Audit, Review and Adaptive Management** | Regular audit, review and improvement of legislation, policies, plans and strategies are essential for efficient and effective natural resource management

Image: Nedlands Foreshore | Frank Kotai

Swan Canning River Protection Strategy

Western Australia's Swan Canning Riverpark is renowned for its natural beauty and cultural and recreational significance. An integral part of Perth's landscape and economy, the Riverpark comprises the Swan and Canning rivers and the public foreshore reserves surrounding them. Located on the WESROC Greening Plan boundary the Swan River has been celebrated across art, literature, music, film and ancient Aboriginal storytelling and culture. It is culturally significant to Aboriginal and non-Aboriginal people and there is an expectation that it will be protected now and into the future. Historically we have changed the natural river system; in the waterway itself, on the coastal plain for industry and suburban development, and in the broader landscape where the Wheatbelt was cleared to feed our growing population. These changes add to the complex web of ecological pressures that impact our rivers and increase their vulnerability to oxygen depletion, nutrient enrichment and other biodiversity threats. This long-term strategy recognises Perth's rapid growth and priority river pressures by establishing a clear path to help conserve the Riverpark's natural, cultural and social amenity values. River system management is challenging; it involves uncertainty and rapid changes. Understanding and addressing the issues goes beyond the capacity of any one organisation. It requires adaptive management, working across organisational boundaries and applying innovative, comprehensive solutions. A coordinated management approach is essential in protecting our rivers and ensuring community values for future generations.

Through consultation with the community, four values were identified:

- **Ecosystem health** | including water quality, environmental flow, biodiversity and foreshore condition, making it the basis of the other values
- **Sense of place** | including the connection people have with the rivers, related to their beliefs, traditions, memories and commitment to looking after them
- **Community benefit** | including aesthetics, providing opportunities and facilities for a broad range of activities, providing activities and events and maintaining public access and safety
- **Economic benefit** | the additional financial benefit of commercial and residential development and tourism opportunities gained by their proximity to the Riverpark.

Known as Derbal Yerrigan to Noongar people, the Swan River was named Swarte Swaene Revier by Willem de Vlamingh in 1697 after the black swans he saw there. This was anglicised to Swan River by Captain James Stirling in 1829.

A coordinated management approach is essential to maintain, protect and enhance the ecological and community benefits of the Riverpark. The Swan Canning River Protection Strategy aims to address the issues facing the Riverpark and will focus on the on-ground actions to achieve four broad outcomes:

Better coordination:

- Increase management coordination and collaboration between organisations with Riverpark responsibilities.

A healthy river ecosystem:

- Improve water quality and manage environmental flows
- Ensure management decisions are based on appropriate knowledge
- Protect, manage and enhance biodiversity

Improving community engagement and enjoyment:

- Maintain and improve sense of place with the Riverpark
- Provide access and a safe environment for Riverpark visitors
- Improve public knowledge and understanding of the Riverpark
- Improve the way we do business.

Image: Cottesloe Foreshore | Frank Kotai

WA Coastal Zone Strategy

Our coast is one of WA's most valuable natural assets, rich in biodiversity, landscape, aboriginal and heritage values. The coast offers diverse opportunities for recreation, tourism, commercial, industrial and residential development, and contributes to the health and social wellbeing of Western Australians. The vision for the WA Coastal Strategy is a sustainable coast for the long-term benefit of the community and visitors to the State. To achieve this vision, 5 key objectives have been adopted to guide the management and use of the coastal zone:

Environment | Conserve the State's natural coastal values and assets through sustainable use.

Key Objective | Protect, conserve, enhance and maintain natural coastal values.

Community | Ensure safe public access to the coast and involve the community in coastal planning and management activities.

Key Objective | Ensure public ownership of coastal and estuarine foreshore reserves for management, safe public access, recreation and conservation.

Economy | Provide for the sustainable use of natural coastal resources.

Key Objective | Ensure natural coastal resources are used in an equitable and sustainable manner.

Infrastructure | Ensure the location of facilities and infrastructure in the coastal zone is sustainable and suitable.

Key Objective | Locate and design coastal development, infrastructure and facilities taking into account coastal processes, landform stability, water quality, environmental flows, hydrological cycles, coastal hazards and climate change.

Governance | Build community confidence in coastal planning and management.

Key Objective | Align policy, planning and development in the coastal zone with the public interest.

Stewardship of the coast is a shared responsibility. Governments at all levels, private organisations, natural resource management groups, the community and individuals each have important, complementary and differentiated roles in coastal planning and management.

Relevant Policies & Documents

The following highlights a number of relevant policies, strategies and management plans identified on WESROC member council sites which are pertinent to the 2020-2025 Greening Plan.

Town of Cambridge

- Local Planning Policy 2.1: Precinct P1: City Beach
- Local Planning Policy 2.1.1: St John's Wood, Mt Claremont
- Local Planning Policy 2.2: Precinct P2: Reabold
- Local Planning Policy 2.3: Precinct P3: Floreat
- Local Planning Policy 2.4: Precinct P4: Wembley
- Local Planning Policy 2.4.1: Jersey Street, Jolimont
- Local Planning Policy 2.4.2: Parkside Walk, Jolimont (Design Guidelines)
- Local Planning Policy 2.5: Precinct P5: West Leederville
- Local Planning Policy 2.5.1: Holyrood Conservation Area
- Local Planning Policy 2.6: Precinct P6: Lake Monger
- Local Planning Policy 3.1: Streetscape
- Local Planning Policy 3.16: Landscaping and Water Sensitive Urban Design
- Council Policy 5.1.1 Management of natural conservation areas within public open space
- Council Policy 5.1.3 Management of Street Trees
- Council Policy 5.1.4 Management of Park Trees
- Council Policy 5.1.5 Street Tree Protection During Property Development
- Biodiversity Action Plan 2011-2015
- DRAFT Biodiversity Action Plan 2016-2020
- Bike Plan Summary Report
- Lake Monger Reserve Management Plan 2008-2018
- Community Engagement Framework 2016
- Community Perception Survey 2006 / 2008 / 2010
- 2010 Values and Attitudes Study Key Findings
- Community Engagement Study 2013
- Your Town Our Future Survey 2017.

City of Subiaco

- Strategic Asset Management Plan 2019
- Strategic Community Plan 2017-2027
- Rosalie Park Management Plan 2013-2018
- Street and Reserve Trees Protocols
- Sustainability and Resilience Strategy 2016-2021
- Urban Forest Strategy 2018
- Verge Policy Management Guidelines 2015
- Plant Pathogen Management Plan 2015–2019
- Environmental Enhancement Plan 2012-2016
- Wildlife Enhancement Plan 2014-2019.

City of Nedlands

- Policy 6.27 Old Swanbourne Hospital Precinct (LPP)
- Policy 6.8 Subdivision Policy (LPP)
- City of Nedlands Urban Forest Strategy 2018-2023
- Strategic Community Plan Nedlands 2028
- Allen Park Master Plan 2017
- Strategic Recreation Plan 2010 - 2015
- Draft Natural Areas Management Plan 2019 – 2024
- Draft Shenton Bushland Management Plan 2019 – 2024
- Draft Allen Park Bushland Management Plan 2019 – 2024
- Draft Hollywood Reserve Management Plan 2019 – 2024
- Draft Birdwood Parade Management Plan 2019 – 2024
- Draft Point Resolution Bushland Management Plan 2019 – 2024
- Draft Mt Claremont Oval Bushland Management Plan 2019 – 2024
- Asset Management Strategy 2019-2029
- Urban Forest Strategy 2018-2023
- Council Policy – Community Friends Groups
- Council Policy - Greenways
- Council Policy – Illegal Clearing of Vegetation
- Council Policy - Nature Strip Development
- Council Policy - Street Trees
- Local Planning Policy – Landscaping Plans.

Town of Cottesloe

- Railway corridor Greening plan created as a landscaping design for the new Principal Shared Path (2019).
- Street Tree Policy
- Street Tree Masterplan
- Beach Policy
- Human Enhanced Climate Change Policy
- Residential Verges Policy
- Town of Cottesloe Natural Areas Management Plan (2008)
- Town of Cottesloe Natural Areas Management Plan Addendum (2015).

Town of Claremont

- Strategic Community Plan 2015-2023
- Tree Preservation Policy
- Street Tree Policy
- Street Tree Masterplan
- Verge Landscape Guidelines, reviewed 2020
- Lake Claremont Management Plan 2016-2021.

Shire of Peppermint Grove

- Community Strategic Plan.

Town of Mosman Park

- Significant Tree (Public Land) Policy 2.1.4
- Street Tree Policy 2.2.7
- Management of Vegetation in Public Reserves
- Verge Treatment
- Bay View Park Environmental Management Plan 2009
- Bay View Park Revegetation Plan 2010
- Buckland Hill Conservation Management Plan 2019
- Chidley Point Reserve Management Plan 2018
- Garungup Reserve Environmental Management Plan 2018
- South Mosman Park Bushland Management Plan 2009
- Mosman Beach Management Plan 2003
- Point Roe Management Plan 2019.

Image left: City Beach | Julian Croudace

Australians of today are deeply concerned about environment issues like global warming. Surviving on this land for more than 60,000 years, Aboriginal and Torres Strait Islanders established effective ways to use and sustain resources. One important aspect is the right of certain people to control the use of resources in a particular area. Aboriginal and Torres Strait Islander people don't see themselves as 'owning' land, animals, plants or nature, but rather belonging with these things as equal parts of creation.

http://www.shareourpride.org.au/sections/our-culture/

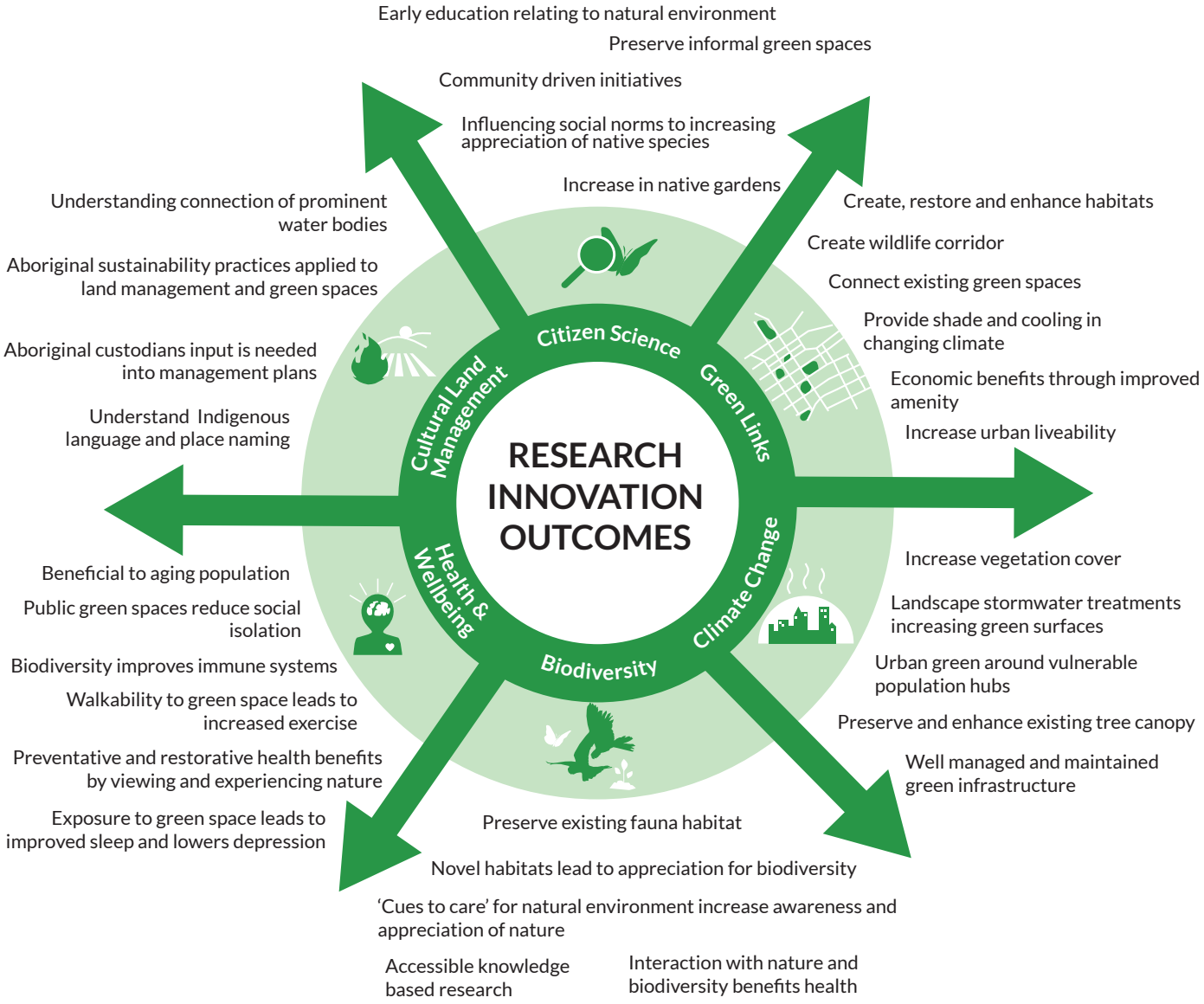


Figure 10: Research and Innovation

3.0 DEVELOPING THE GREENING PLAN

INNOVATIVE GREENING APPROACHES

Cultural Land Management

Incorporating Aboriginal people's knowledge and understanding of place is essential for effective management of green spaces, however as research states, this is not currently part of the Aboriginal Heritage (AH) Act, it "*does not include provision for management plans, denying Aboriginal custodians an avenue for proactive and holistic management*" (Kwaymullina et al., 2015). Acknowledgement of significant and sacred sites is needed to ensure key places are appropriately included in management plans. Jones et al (2016) discusses the lack of registration for significant sites, the reinterpretation of 'sacred' now only includes sites with ongoing religious significance. "Thirty-five sites were deregistered and 1,262 sites were blocked from registration" (Butterly, 2015). "*At no stage have Aboriginal custodians been notified about the changing status of their heritage*" (Jones et al. 2016). In March 2019, a discussion paper for the review of the Aboriginal Heritage Act 1972 set out proposals to recognise, protect, manage and celebrate the places and objects that are important to Aboriginal culture. The Aboriginal Heritage Act 1972 Review Discussion Paper identifies a number of key changes which will provide guidance and influence in the land management and greening of WESROC. The table below provides a comparison between the current and proposed positions which directly relate to the WESROC Greening Plan.

Image left: DBCA Aboriginal Ranger Program | https://www.dbca.wa.gov.au/parks-and-wildlife-service/aboriginal-ranger-program

Table 3: Aboriginal Heritage Act 1972 | Proposed Changes

#	CURRENT POSITION ABORIGINAL HERITAGE ACT 1972	PROPOSED POSITION CHANGES
1	Intangible heritage is not protected.	Landscape features associated with the Dreaming and the songs and stories that connect them will be recognised as cultural landscapes and therefore covered by the new Act.
2	Aboriginal people have to prove why a place or object is important and have no control over what is registered on the Register of Aboriginal Places and Objects.	Aboriginal Knowledge Holders will no longer have to prove or justify why a place or object is important to them, they will simply have to provide enough information to explain why it is important and where it is located. Aboriginal Knowledge Holders will be able to register any place or object that is culturally important to them as long as it meets the minimum reporting standards set by a new Aboriginal Heritage Council to ensure the information recorded on the Aboriginal Heritage Register is clear and accurate. (The Aboriginal Heritage Register will be the new name for the Register of Aboriginal Places and Objects).
3	There is no statutory requirement for Aboriginal people to be consulted about impacts to their cultural heritage	Local Aboriginal Heritage Services (LAHSs), which must be 100% Aboriginal, will ensure that the right people to speak for Country are identified and either conduct or coordinate culturally appropriate consultation. Where a LAHS exists, there will be a statutory obligation to consult with the LAHS on activity within its area of responsibility. Where there is no LAHS in an area, the Department of Planning, Lands and Heritage will be required to identify and consult with the people who have cultural authority for the area.
4	There is no statutory role for Aboriginal people in making decisions about their cultural heritage	By law, the relevant Aboriginal people's views must be taken into account in any decision that affects Aboriginal heritage. Local Aboriginal Heritage Services (100% Aboriginal) will have the statutory role of ensuring that the right people are involved in the decision-making process and facilitating agreements between them and land use proponents in their areas of responsibility. Decisions on land use proposals that have a significant impact on Aboriginal heritage, whether they are subject to an agreement or not, will still be made by the Minister for Aboriginal Affairs, but the Minister will have a statutory obligation to have regard to the views of the relevant Aboriginal people.
5	There is no statutory requirement to promote public awareness of the importance of Aboriginal heritage (as there is for State heritage)	The Aboriginal Heritage Council will have a statutory function to promote education, training and raise awareness of the importance of Aboriginal heritage, and provide grants and other assistance to promote its conservation.
6	There are restrictions on the active management of heritage in Protected Areas	New regulations will allow the appropriate Aboriginal people to manage their heritage in Protected Areas.

It is important to address the assumption that western knowledge is superior, as Stocker et al. (2016) states, "*knowledge partnerships…often carry the implicit presumption that Western knowledge systems are superior to indigenous knowledge systems*" resulting in a "*failure to recognise the critical relevance of these latter to sustainable environmental management*" (Langton, 1998). Therefore the challenge is to develop management methods that are not only consultation based, rather a collaborative and holistic approach is needed. Across agencies and community groups with coastal planning and management responsibility, higher order Noongar sustainability principles should be applied. Ideally in a collaborative approach with Noongar owners (Stocker et al. 2016). Howitt et al. (2013) states "*the priorities of the conservation agency will be insufficiently flexible to allow Noongar agency and ontologies to be expressed*", ensuring that a flexible approach is taken toward management of green spaces will be key in a collaborative way forward.

Aboriginal knowledge can provide a deeper layer of understanding place and ecological systems that could improve future management practices. Aboriginal people's approach to "*Management of country is interwoven with family, spirituality (the Dreaming) and knowledge*" (Jones et al, 2016). An understanding of seasonal weather, species and coastal conditions is evident in traditional knowledge of ecological systems and can therefore benefit planning and decision-making for sustainability and climate change (Turner and Spalding 2013). Indigenous language and use of place naming is an important way of understanding place, environment and history. "*The creation stories are embedded in the names of places in the landscape of the song line*" (Nannup and Hopper 2015:4). Wooltorton et al. suggests that "*for human and ecological health and well-being, education for management of groundwater and wetlands must include Indigenous language studies – including the role English has played in the colonisation and depletion of Country*". Embedding this knowledge is critical to the development of management and maintenance plans for future and existing greenways within WESROC. It can also be applied to creating a more informed Green Community through education and advocacy by the LGA members of WESROC.

It is important to ensure a connection and presence for Aboriginal people in key places of significance. As Harris (2002) discusses, despite families having long standing connection to key public spaces, a lack of presence can lead to the assumption that these are not Aboriginal spaces (Jones et al, 2016). "*Aboriginal people need to be more than artists and consultants. They need housing and services in the area. Furthermore, they need to be involved in the planning and management of these spaces so they feel comfortable returning to them*" (Jones et al, 2016). Creating opportunity for ongoing connection would benefit not only people's connection to place but also the environment. "*One's place and all its species, waterways and entities are family. This Noongar-place*

relationship is called Kurduboodjar, meaning both heartlands and love of place" (Woltorton et al. 2019).

The WESROC area includes water bodies such as Lake Monger, the Swan River and a prominent section of coast line, therefore the connection and understanding of water bodies is necessary for appropriate planning and management. "*The relationship between people's waug – soul, spirit or breath – and waugal, the powerful, vital dynamism of Boodjar – explains the deep interconnection between the health of people and ecosystem health through gabbidordok*" (Wooltorton et al. 2019), *gabbidordok* is defined as living water. The spirit of place comes through in this description of place and waterways having a living and animated nature. "*Noongar people believe that if you harm the resting place of the rainbow serpent or his earthly beings at the place of water then the country would dry up and die.*" These ways of understanding water and the interconnectedness of our environment are deep and spiritual; and should be acknowledged in our approach to waterways within the urban landscape. It is essential for environment and the health of communities that water ways, including ground water, are managed holistically. As Wooltorton et al. (2019) discusses, Human actions on the surface dictate ground water's condition, and these actions include draining, fertilising, building, boring and pumping, burning or respecting water and its cosmology. "*These groundwater reciprocities and interdependencies can be enriched by on-going Noongar stories and contemporary social and ecological thought*".

Health & Wellbeing

Social and mental wellbeing

There are proven links between green infrastructure and improved wellbeing at an individual and community level, Shanahan (2016) found that "higher levels of nature relatedness predicted greater feelings of social cohesion and higher levels of physical activity" based on a scientific report undertaken to explore the health benefits from natural experiences. Public open space facilitates potential for social interactions within communities and therefore, this potential could lead to greater wellbeing, reduce social isolation and create social capital (S. M. A. Haq, 2011).

WESROC is estimated to have 2,010 Ha green space. Bushland is 854 Ha and structured recreational places with amenity is approximately 1,156 Ha.

Without enough green space in the local environment feelings of loneliness and lack of social support increase. According to the article "Creating sense of community: The role of public space" in the Journal of Environmental Psychology vol 32, it is important that both natural green spaces and places with amenities are provided, as an increased sense of community is linked to landscaping and pathways within natural areas. Furthermore, there has been extensive research that suggests biodiversity is positively linked to psychological and mental health outcomes. Biodiversity can increase exposure to microbiota which improves health via immune system development and regulation. Therefore, it is important to encourage increased biodiversity in public spaces and protection of natural open space within our urban environments. This can be facilitated through increasing tree canopy, which is an important part of passive recreation relating to biodiversity and recreation within an urban landscape. Further evidence shows that complex vegetation arrangements or natural vegetation is preferred by users of green space and grass only areas less desirable. Figure 8: Vegetation density, indicates the proportion of each type of green space within WESROC.

Green spaces and the natural environment provide a plethora of nonmaterial benefits such as "spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences" as well as preventative and restorative health

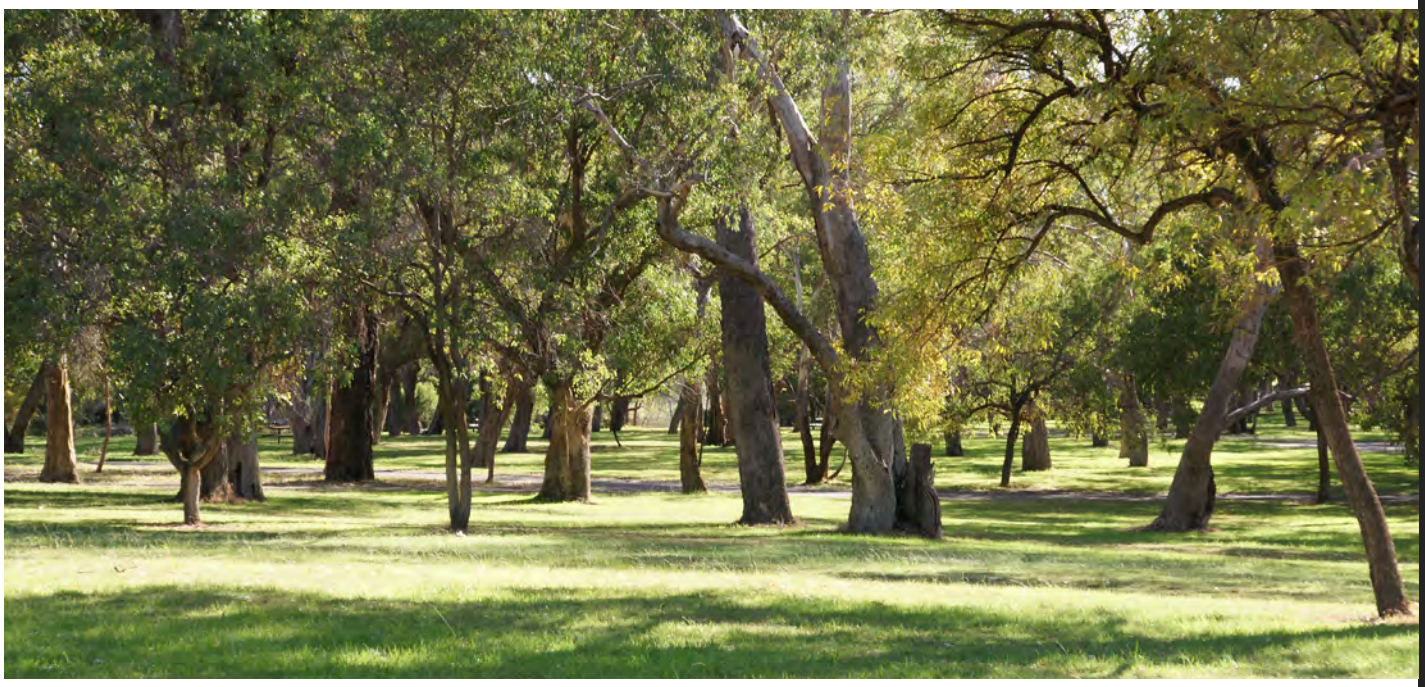


Image: Bold Park | Nicole Croudace

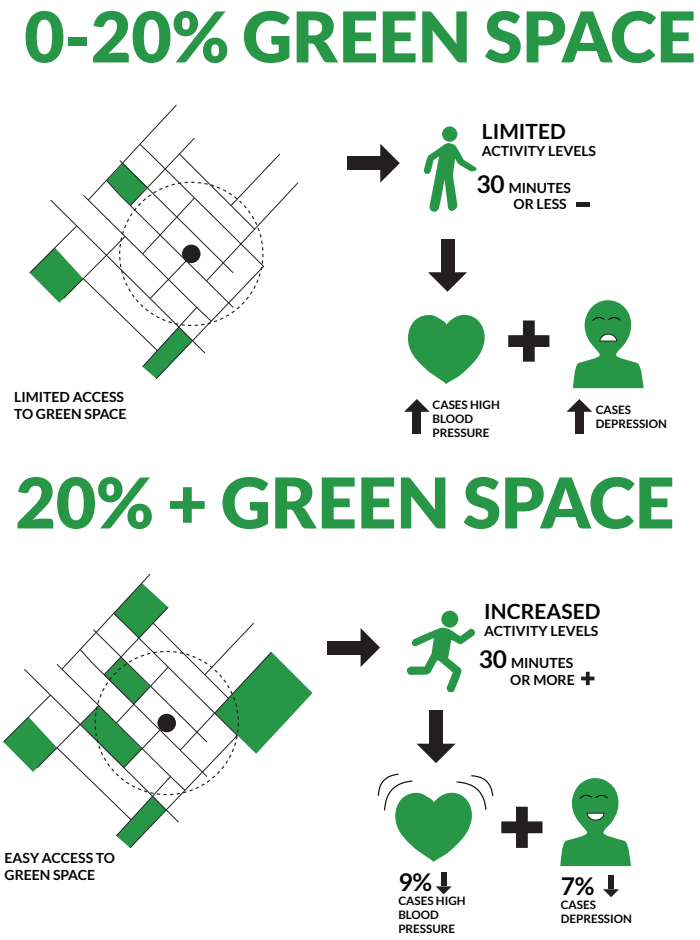
advantages. According to Cecily Maller (2005), contact with nature can offer an affordable, accessible and equitable choice in tackling growing mental health issues. Francis et al. (2012) notes that to benefit mental health, the quality of public open space is more important than a quantity. De Vries et al. (2013) found the quality of streetscape greenery linked to the perceived social cohesion in neighbourhoods, this has been defined as "a sense of community, with a focus on trust, shared norms and values, positive and friendly relationships, and feelings of being accepted and belonging".

The creation of quality natural and structured open space and streetscapes can be a powerful community support mechanism. A number of suburbs within WESROC are fortunate to have all of these qualities; however, there are opportunities that can be explored to further reinforce and connect these places through well defined green infrastructure networks.

Liveable walkable places benefiting physical health

As urbanization increases, physical and mental health is becoming an important global issue. Cities are epicentres for chronic, non-communicable physical and mental health conditions. Quality green space provisions are a wise investment in public health, views of nature and experiences in nature have shown to assist physical healing. An article in the Journal of Environmental Psychology, 2016 by Gidlow states, when walking; natural landscapes produce better short-term cognitive benefits than residential environments. Furthermore, green space can impact ongoing health through better sleep patterns; living in a greener neighbourhood was linked to a lower risk of insufficient sleep. Ensuring neighbourhoods are planned with walkable access to green space has proven to increase physical activity.

Increased access leads to increased activity levels and exercise which has shown to reduce health issues; statistics determined in the study - Health Benefits from Nature Experiences, Scientific Reports, vol. 6 2016 stated 7% less cases of depression and 9% less cases of high blood pressure if people met the minimum criteria of 30min exercise or more. The amenity and type of green space provided can directly impact improved health through providing greater opportunity for exercise or more varied activities. This improved physical function is associated with retention of green spaces and bushland. Reasons could be due to the size and diversity of the landscape and larger spaces providing more opportunity to be physically active for longer. The prime location within WESROC of this scale and offering the diversity of landscape type is Bold Park. For improved activity and likelihood of social interaction it may be better to provide one large park in the neighbourhood rather than many smaller parks. It is also imperative for parks to have certain qualities that encourage visitation and interaction, such as visible access points and pathways, and providing places to relax and socialise.



"Compared with participants living in neighbourhoods containing 0–20% green space, those in greener areas were significantly more likely to walk and participate in moderate to vigorous physical activity at least once a week."

"Testing spatial measures of public open space planning standards with walking and physical activity health outcomes: Findings from the Australian national liveability study," Landscape and Urban Planning, vol. 17 2017

Image: Reabold Hill | Julian Croudace

Benefits of Private Green on health

In addition to public open space, private gardens offer important opportunities for people to connect with nature. Gardening can benefit mental health and most often occurs in a private garden. Private green spaces can be a buffer to the lack of public green spaces, however as private green is diminished through infill development there is increased need for public spaces that are easily accessible. This suggests that private spaces may buffer the need for public green in local neighbourhoods, or conversely as private space becomes less available there is a greater need for public greens closer to home.

An example is evident in Adelaide's older suburbs where with infill development, these places have seen a large loss of private green space without a corresponding increase in POS. A similar trend has happened in the Subiaco area with high rates of urban infill development, this increases the need for quality public green spaces that are easily accessible. Influencing this conundrum, will be the role of the planning officers within each LGA, in assessing infill development in consideration of the potential access to public green spaces within an acceptable walking distance of the development.

Safety perceptions in green space

Perceived safety of green spaces can impact if and how they are used as well as a resident's sense of community. Although people value benefits of green space, they are sometimes associated with feelings of insecurity and crime. This can lead to a reduced use for physical activity within a public green space and then compounded by minimal maintenance with more graffiti can increase stress levels, therefore these public green spaces are less likely used recreationally. Concerns for community safety in certain types of green space are impacted by perceived or actual crime rates, with well-known implications for mental health according to the study "Does rising crime lead to increasing distress?" for the Social Science & Medicine, vol. 138 in 2015. Additionally, reduced use of green space can be impacted by the quality of access to them, physical or visual barriers such as busy roads and derelict housing can deter resident's use due to the concerns around safety and increased low aesthetic appeal. Psychological benefits are linked to green areas that are abundant in wildlife, however these types of places can be perceived as less safe for children. This indicates a need for education on safety in relation to nature and the 'wild' as these fauna rich places could be a missed opportunity for increased mental wellbeing, additionally there is evidence that experiences in nature throughout childhood appear to increase adult environmentalism, based on research undertaken by Wells 2006.

Demographics

Various demographics benefit from green space in different ways. The provision of green space has proven to be extremely beneficial for the elderly demographic. It is difficult for older people to maintain physical activity, therefore providing green spaces that encourage older people to be active, even if it is only at a light level, is important for public health. Trees increase likelihood for elderly to use public spaces however it is equally important to provide amenities such as seating and toilets that enable older people's ease and enjoyment in public spaces. Social isolation has been significantly associated with increased mortality in older people, therefore easy access to public spaces that provide opportunity for social interaction are imperative. According to Kaczynski 2009, the "Association of parkland proximity with neighborhood and park-based physical activity: Variations by gender and age" states that younger and older groups are more sensitive to greenspace provision than middle-aged adult. This illustrates the need to provide green spaces with particular amenity for older people, people with disabilities and women and children as The United Nations (2016) has identified in their goals for 2030. There is opportunity for the LGA's within WESROC to identify the areas of significantly aging populations and focus informed efforts of greening and amenity within these zones.

Image: Forest Red-tailed Black Cockatoo | Western Australian Museum

Re-wilding Urban Landscapes

Flora and Fauna

Public Open Spaces are vital within urban areas for providing fauna habitat. Within urban green spaces there are strong links between the presence of native plants and the diversity and abundance of native animals. Studies have shown that native planting in residential areas, including private and public space, benefit native bird species.

Good quality open space should include a variety of habitats, structural complexity in understorey vegetation, and specific habitat features such as tree hollows.

"Key lessons for achieving biodiversity-sensitive cities and towns," Ecological Management & Restoration, vol. 16, no. 3, 2015

Bold Park is a significant natural public open space within WESROC that provides quality habitat for native fauna, it is key locations like Bold Park that are preserved to encourage biodiversity. A decline in conservation and protection of existing habitats can have detrimental impacts on fauna and therefore need to be preserved as a priority. Key habitats such as native mid storey and ground vegetation, trees (both live and dead), seedlings, hollows and logs are declining. If habitat structures are in short supply or non-existent, species may not be able to survive in urban greenspace habitats. Anti-social behaviour and safety for recreational access concerns can be a reason why particular habitat structures are reduced in urban landscapes.

Specific fauna habitat requirements and appropriate plant species can be identified within WESROC to ensure they are protected and reinstated in urban green spaces. Table 2: Declared Rare and Priority Flora Species, and the 'Fauna' section of this strategy provide a starting point for flora and fauna species that can be addressed as a priority. Clear communication and advocacy to facilitate improved understanding of native plants and the types of fauna that are attracted. As an example, some native plants labelled as 'bird attracting plants' attract native honeyeaters that can be aggressive therefore not providing safe places for smaller

species. To help minimise the impact of aggressive birds that deter other more passive bird species, would be the planting of dense, low-nectar producing native shrubs. Reintroduction of other species is also possible in urban habitats. This could include amphibians by creating and maintaining appropriate levels of habitat succession, healthy water quality, terrestrial habitat, connection to other populations and eliminating fish predators within the wetlands and waterbodies found within WESROC. Urban infrastructure such as lighting has shown to have negative effects on vegetation. It can cause early blooming, late leaf loss and longer growth periods for plants, which has potential to impact the floral community makeup. Therefore, consideration needs to be made by the local government authorities within WESROC for flora and fauna when selecting amenities for public open spaces.

Biodiversity in the urban environment

Cities are important environments for conservation, with potential opportunities to integrate people in conservation through innovative habitats. According to Key lessons for achieving biodiversity-sensitive cities and towns," Ecological Management & Restoration, vol. 16 2015, "In Australia, cities are disproportionately important for the conservation of species of national significance, with urban regions supporting more threatened species per unit-area than non-urban regions". In an urban location it is vital to not only include green spaces in new developments but conserve existing habitat structures wherever possible, to retain habitat structures in urban greenspace that are perceived as 'hazardous' or 'untidy' by the public. This is especially important as these structures are often difficult to replace once removed.

The loss of a single large eucalypt tree in an urban area cannot be completely offset by establishing many younger trees, and simple revegetation offset tactics inadequately compensate all species.

"Key lessons for achieving biodiversity-sensitive cities and towns," Ecological Management & Restoration, vol. 16, no. 3, 2015

The recent anecdotal community reports in 2018 of Peregrine Falcon's using a Crawley apartment building as a breeding ground illustrates the potential city infrastructure has in facilitating habitat. This example of being in close proximity to residential land use can contribute to local knowledge and understanding of fauna which in turn leads to a stronger appreciation for the natural environment. Interacting with urban biodiversity has been shown to benefit physical and psychological health, improve quality of life, and raise real-estate prices.

Connecting people with nature

Urban infrastructure can be a vehicle through which people engage with their natural environment. Ways to decrease negative misconceptions include 'Cues to care' these can be elements such as attractive seating, intentional paths, inviting access points, well maintained garden beds, and signage, refer Figure 11.

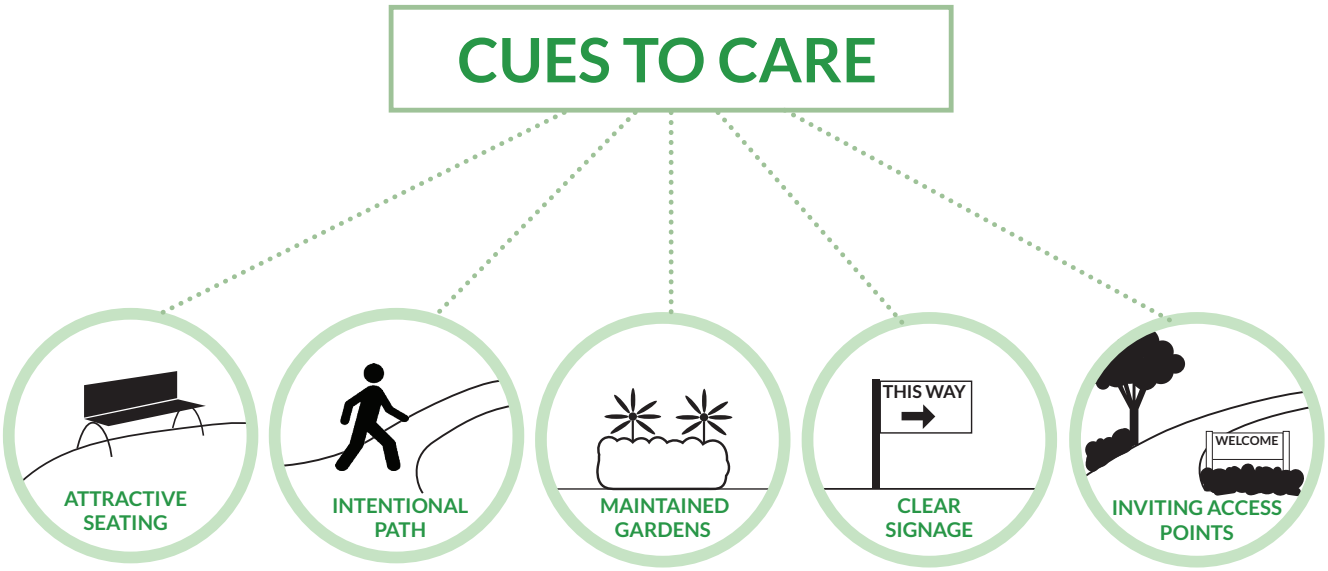


Figure 11: Cues to Care

Image: Shenton Quarter | Nicole Croudace

Community connection, perception and appreciation for nature within urban green spaces and adjacent reserves can be facilitated through conservation efforts, such as education about local biodiversity. Creating opportunity to connect with the natural environment can engender stewardship for the local environment, therefore promoting these places as multi- functional for people and biodiversity. It is important to increase environmental awareness in residential communities using methods such as Community Groups, Friends of Groups and other programs including sustainable living workshops (composting, water-wise and bush friendly gardens) and guided walks. Improved awareness and guidelines on specific species identified for protection within specific neighbourhoods can lead to better conservation potential and outcomes in built projects. For example, earthworm populations decrease in soils covered with gravel and increase in soils covered with bark mulch and no plants. Sharing this type of knowledge has potential to educate and impact local communities' choices in their own gardens as well as understand processes and environments in public places. These research findings may guide future material and amenity choices within WESROC's public open spaces.

Pollinators

It is an essential ecological survival function. Without pollinators, the human race and all of earth's terrestrial ecosystems would not survive.

In Australia it is estimated that approximately 65% of all flowering plants and some seed species such as cycads and pines, require insect pollinators. This percentage is even higher, up to 80%, for crops that provide fruits, vegetables, textile-related fibres and medicinal products. The majority of flowering plant species found world-wide require animal-mediated pollination to make the seeds that will become the next generation of plants.

However, a study undertaken in 2017 by a UWA PHD student has found that birds are much better at pollinating the Western Australian floral emblem, the Kangaroo Paw, than bees, mainly due to their size. In the south-west of WA, approximately 15% of the 8,000 flowering species are pollinated by birds and/or mammals. This is the highest percentage in the world. However, little is known about the impact of birds and mammals on pollinating plants. 'We have highly fragmented landscapes in WA, and birds are able to travel further distances,' and 'It's quite easy to see that birds are able to share greater amounts of pollen more widely than insects can.' This ultimately keeps up higher genetic diversity, which is useful for a species' continued survival. The study adds that improving our understanding of the role that birds and mammals play in pollination will allow us to make more effective management and conservation decisions in relation to biodiversity and greening. 'This is just a small part of the overall puzzle. Right now, nearly 40% of plants threatened with extinction in the southwest are pollinated by birds or mammals, which is quite disproportionate. Maybe it's because birds aren't around in these areas or they are outcompeted for resources or there are others plants being favoured over local native plants.'

Pollinators are primarily insects, but sometimes avian or mammalian; they fertilise plants, resulting in the formation of seeds and the fruit surrounding seeds. There are many pollinator species globally however only a few species of pollinators have a direct and easily recognised economic importance to the contribution to ecological function and biodiversity resilience. However, it is possible that pollinator species richness may create resilience to losses of current dominant species. Western Australia is recognised as a diversity hotspot across the globe's Mediterranean climate areas with over 13,000 species of plants therefore this process is critical to long term greening and biodiversity. This significant diversity has evolved through aridity, low carbon soils and a lack of either glacial or volcanic activity to add mineral nutrients to the local geology. The relationships with pollinators include some of the most extreme and bizarre examples anywhere on the planet. In Western Australia, marsupials, birds, bees, beetles, wasps, moths and even emus have a role in pollinating our rich species diversity.

Key management and policy measures need to focus on species not just in human dominated landscapes but need to benefit wider diversity of species including those in specialised habitats. Furthermore, specific practices targeted at endangered and

Image: Example of a very wide east-west orientated street - Grant Street Cottesloe

rare species are needed to not just guarantee the habitat requirements of a wider diversity of species, but for intrinsic biodiversity value. Since colonisation, Perth has lost 70% of its green cover. By 2050 it is expected a further 3% will be lost. This is habitat destruction on a huge scale. The following list critical roles pollination plays in the local WESROC environment:

- Pollination through insects and other local fauna species is a much more reliable and efficient pollination mechanism than chance dispersal.
- Determines plant community structures.
- Pollination by insects and birds is particularly important for many Western Australian native trees and shrubs, particularly the Myrtaceae family. Therefore, the retention and protection of mature existing native tree species and remnant vegetation is critical.
- Pollination is vital for crop production. One third of the human food supply is crops that are dependent on pollination by bees.

Providing support to pollinators on a small scale is a good method of supporting this critical network in an urban environment. There are a number of approaches individual residences, schools, community groups or other institutions within WESROC can make a difference. These are outlined below:

- Protect existing natural native vegetation | where possible retain and protect existing native tree species and remnant vegetation.
- Plant a native garden | choose native species, particularly species from the Myrtaceae family in Western Australia.
- Seasonal flowering | ensure species planted have a variety of seasonal flowering, this will ensure there is always flowering so that the pollinators have something to attract them every season.
- Minimise mulch | leaving bare soil exposed in some areas will provide habitat for some species of pollinators.
- Bird and bee real estate opportunities | create opportunities to support habitat through retaining dead tree trunks or installing a bird or bee house or similar.
- Garden structure | the bordering around fruits and vegetables with native flowers will improve pollination of the crops and also support bees when the crops stop blooming. It will also attract and support other pollinators such as wasps and hover flies that control crop pests.
- Avoid using chemicals in backyard gardens | chemicals and pesticides can affect more than pests. Installing plants that attract natural pest-eaters as well as undertaking "companion planting" is an excellent approach to supporting pollinators in a garden setting.

Climate Change

Changing climate

The WESROC precinct is bordered by large water bodies including the Indian Ocean and the Swan River to the West and South. It is therefore largely affected by changing coastal conditions. Historical accounts of sea level change, as well as extensive research, have shown that climate change is undeniable. Although 7000 years old, Aboriginal accounts of rising sea levels associated with the Holocene warming have been found to be accurate (P. D. a. N. J. R. Nunn, 2015). Stories of a time when people could walk out past Wadjemup Bidi (Rottnest Island), illustrate the change that has already taken place in Western Australia's coastal environment. In the story 'When the Sea Levels Rose' (N. Nannup, 2006), a proactive approach was taken to sea level rising, "Nginyarn and kaarda knew… and they prepared for it". A proactive approach is needed now in regards to Urban Heat Island (UHI) effects and our changing climate. Opportunities to embark on a partnership with Traditional Land Owners and the Local Governments of WESROC, could be a positive step towards enlightened land management practices associated with climate change.

Urban Heat Island effect

The increase of global warming will worsen the adverse effects of urban heat islands on health and the macroeconomic costs which are associated with maintaining a comfortable living environment for people. Ensuring cities have well connected and managed urban green infrastructure such as parks and trees is key to mitigating the effects of UHI. According to the Victorian Centre for Climate Change and Adaption Research, just a 10% increase in vegetated cover would reduce urban surface temperatures during the day by approximately

one degree Celsius. Trees specifically shade buildings and streets in the urban environment. While the WESROC area has a significant mature tree network, there is opportunity to increase greening and shade provision. Specific streets that should be prioritised for tree planting can be identified by the Height: Width ratio. In a study completed in 2015, Planning for cooler cities: A framework to prioritise green infrastructure to mitigate high temperatures in urban landscapes; wide /very wide, east-west orientated streets should be prioritised for street trees because of high solar exposure. For example Grant Street in Cottesloe, refer image above.

It is important to ensure established trees are given supplementary irrigation in extreme heat as hot weather leads to low water availability. Large trees dying have the most serious impact in extreme weather conditions, this is due to the reduction in cooling they provide, the associated replacement costs and the time to grow to provide the same positive cooling affects. In managing heat trapping it is best to ensure trees do not form a continuous canopy, this allows ventilation and long-wave radiation to escape through the foliage, rather than trapping it at ground level. Parks also play an important role in urban green infrastructure; research data suggests parks cooling effects can reach up to 1 km from the park boundary and water bodies can increase cooling effects. Refer Figure 5: Land Use identifies existing open space. Preserving existing green spaces and ensuring they are healthily maintained is an important part of Local Government's responsibility as caretakers of these spaces which are a vital part of the whole urban environment.

Stormwater treatments

The hydrological benefits of urban green space have been well researched, demonstrating the management of stormwater runoff through landscaping has cooling benefits and provides fauna habitat. Hard stormwater treatments can be reduced through the application of vegetation to detain water and encourage aquifer recharge. These systems are able to reduce water treatment costs and flooding risks, and they can also provide new or additional habitats for plants and local fauna within the urban environment. Increased complexity of vegetation habitats can increase hydrological resilience and improve urban biodiversity habitats. There are a number of existing streetscape locations within the urban environment of WESROC that currently have improved runoff and stormwater treatments, including the Parkside Development in Jolimont, which has integrated rain gardens into the streetscape, refer image above. Another example in a very urban setting is the Kings Square redevelopment in the City of Perth, refer image above. As part of the design of the streetscape, a water sensitive urban design strategy was developed that includes a network of raingardens integrated with street parking. These raingardens provide retention, filtration, litter management and bio-remediation outcomes and integration with street furniture and lighting. The raingardens are designed to fit into the cross-sectional parking dimension between road crossing points. They are located to accommodate alfresco dining and retail opportunities at certain locations with shade, rest points and amenity provided by the vegetation and trees. These two residential and urban examples highlight there is an opportunity to identify additional locations either through carparks, planning conditions for new developments and in public open space within WESROC to implement similar solutions.

Effects of climate on community

Our urban planning approach and local government policy needs to address areas with particularly vulnerable communities to ensure UHI effects are reduced. "Outside aged care facilities, schools and community centres, health care centres, socio-economic support locations, and social housing complexes", are all areas identified by the study, Planning for cooler cities: A framework to prioritise green infrastructure to mitigate high temperatures in urban landscapes, that offer a starting point for urban greening efforts to be made. Refer Figure 12: WESROC Example of vulnerable communities; this is an example of key locations within a WESROC LGA, that should be prioritised for increasing green infrastructure initiatives. Vulnerable populations include the elderly, people with pre-existing physical or mental illness, infants and children as well as people living alone or in low socio-economic circumstances.

Image: Kings Square Rain Gardens | Drawing by AECOM

Image: Rain Gardens in Parkside, Jolimont | Julian Croudace

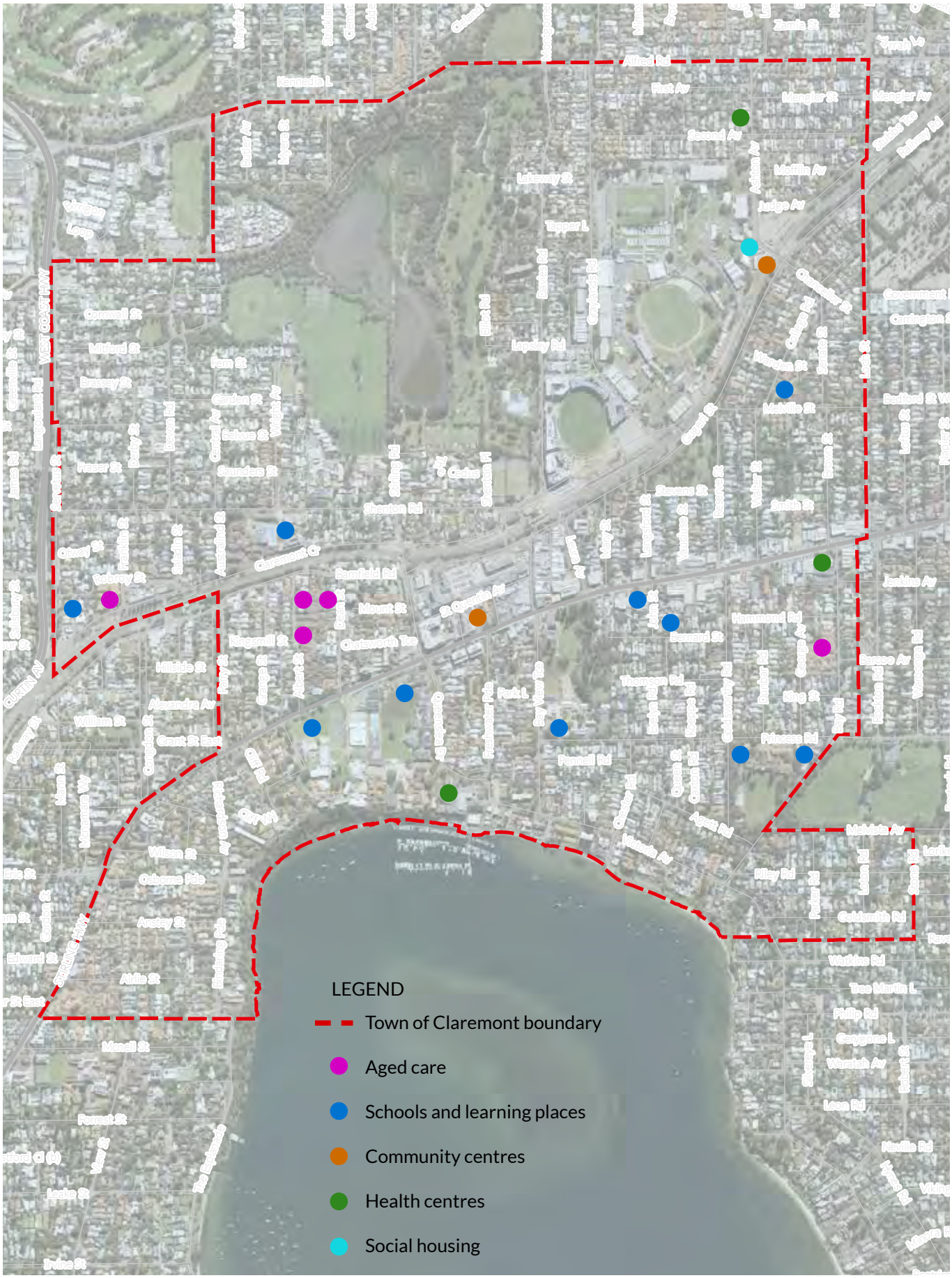


Figure 12: WESROC Example of vulnerable communities

Image: Friends of Bold Park Bushland Inc | https://www.facebook.com/ReaboldHill/

Identifying ways to mitigate the UHI effects within these communities will greatly benefit the wider community and has potential to relieve stress on health services. To identify these areas and the particular risk factors, knowledge of key LGA staff should be sought combined with consulting with professionals that have a deep knowledge of local demographics, such as local social service and health professionals. Vegetation in lower income urban areas is especially important as the Ecological Applications, vol. 21 2011 states, "lower income populations have less means to cope with extreme temperatures. While wealthier people may have access to cooling systems, the low-income population relies more on what is publicly available." Therefore, it is imperative to ensure the green infrastructure publicly available is abundant and maintained effectively to service its local community. Figure 5: Land Use, shows the green infrastructure currently existing within WESROC.

Citizen Science

The importance of private spaces

Private spaces and residential gardens are particularly important opportunities to improve biodiversity and green links, as urban areas comprise of a large portion of domestic land use. The Land use map, Figure 5 displays the high portion of urban land within WESROC. Maximising biodiversity, conservation through tree retention and encouraging native planting are key activities which can easily occur within residential land holdings; they are also considered vital in developing wildlife corridor connectivity with in urban areas. Gardens facilitate the essential interactions between people and wildlife which foster long-term pro-environmental behaviour, according to P. T. Maiteny who authored Mind in the gap: summary of research exploring 'inner' influences on pro-sustainability learning and behaviour for the Environmental Education Research in 2010. It has been concluded that the combined impact private spaces can have on the wider environment can be both positive, through enhanced biodiversity and negative, through application of lawn chemicals, predation by domestic cats, or the enhancement of biological invasions (Goddard, 2013). Therefore, education and influencing popular opinion is an important method through which these spaces can contribute positively. A 2009 article in Landscape and Urban Planning, Australian native gardens: Is there scope for a community shift? Suggests - "Norms theory suggests that if we can change the paradigm of what is fashionable in terms of gardens then this can be used to create a shift in gardening practices. The article continues with opinions about the aesthetic appeal of native gardens are becoming more positive; this suggests and gives hope for changing attitudes towards encouraging biodiversity into our own backyards.

Community initiatives

Incentive programmes are an opportunity that encourage the community to plant native species as well as increase awareness and positive associations with the environment. A key method in addressing this is through the cultural norms and conventions of residential landscapes. Research undertaken by Goddard in 2013 - Why garden for wildlife? Social and ecological drivers, motivations and barriers for biodiversity management in residential landscapes, showed that the most important influence on gardening are friends and neighbours, this implies that prevailing social norms are the main driver for management and attitudes towards gardens. Methods which local government can adopt to encourage native gardens include sending out information on local indigenous plants to all new residents as a welcome to the neighbourhood, and building relationships with local nurseries to encourage supply and demand for local native species particular to those vegetation communities in that region. It has been discussed that top-down financial incentives do not have as much of an impact as "community-driven initiatives that engage, educate and empower residents". Therefore, community driven projects should be facilitated and encouraged by WESROC local governments as a priority.

'Spaces between'

The exchange of ecological knowledge can empower residents to become local stewards thereby creating sustainable and resilient communities. Spaces that serve

this purpose are allotment gardens, pocket parks, empty lots (private or Council owned) and collectively managed urban places. The term 'spaces between' has been defined by Moran in an article in GeoJournal 2011, titled - Between outside and inside? Prison visiting rooms as liminal carceral spaces. They are spaces that are "'at the margins', characterized by emergence and flux, fluidity and malleability, and are neither segregated nor uncontained". These places present immense opportunity for ground up projects with strong community involvement. Research shows that special features of informal green space that distinguish it from formal spaces are appreciated by residents, these features include naturalness, less maintained look, diversity and mystery. These imperfect spaces are an asset to community and biodiversity and should therefore be protected from development as part of urban infill.

Studies have demonstrated that nature experiences in childhood play a vital role in developing nature-oriented attitudes which in turn creates preferences for nature-based activities in adult life.

"Visiting green space is associated with mental health and vitality: A cross-sectional study in four european cities," Health Place, vol. 38, pp. 8-15, 2016.

The positive impacts of Education

Continuing education is needed to dispel the misconceptions surrounding safety in natural environments and the fauna that inhabits them. Research shows the highest subgroup of 'unwelcome' animals is insects; unfortunately, this is concerning as insects are a vital part of global biodiversity and have a very important role in ecosystem function. In Goddard's study, education of children and the school environment is shown to have the greatest responsibility for encouraging first-hand experience of nature.

Therefore, schools have a strong impact on community awareness and attraction towards natural environments, it is these institutions who must ensure ongoing connections to nature are fostered. The responsibility on a local government and planning scale within WESROC is to provide quality spaces for children to connect with nature that are in close connection to educational intuitions. These spaces provide opportunity for risk taking, discovery and creativity, providing a stronger sense of self, inspiring basic emotional states, and enhancing psychological restoration. Initiatives encouraged by the Town of Claremont in collaboration with local schools to undertake Landcare activities are a good example of fostering an appreciation for our natural environment in children.

Green Linkages & Infrastructure

Green infrastructure's environmental benefit

Green infrastructure (GI) is defined as a network of spaces including "parks and reserves, backyards and gardens, waterways and wetlands, greenery on streets and transport corridors, pathways and greenways, squares and plazas, roof gardens and living walls, sports fields and cemeteries (Roger Jones, 2015). Figure 13: What is Green Infrastructure? illustrates the spaces that define green infrastructure within WESROC and Figure 7: Bush Forever Plan, displays the existing green spaces within the WESROC area. Each of these spaces is an important part of the whole, providing benefits to people and biodiversity, GI plays a key role "in creating, restoring and enhancing habitats and linkages between them" (Gemma Jerome, 2019). These spaces serve urban communities in changing the local macro-climatic conditions. Protecting existing green links and providing extended connections for biodiversity is an important goal

Image: Nature Orientated Attitudes

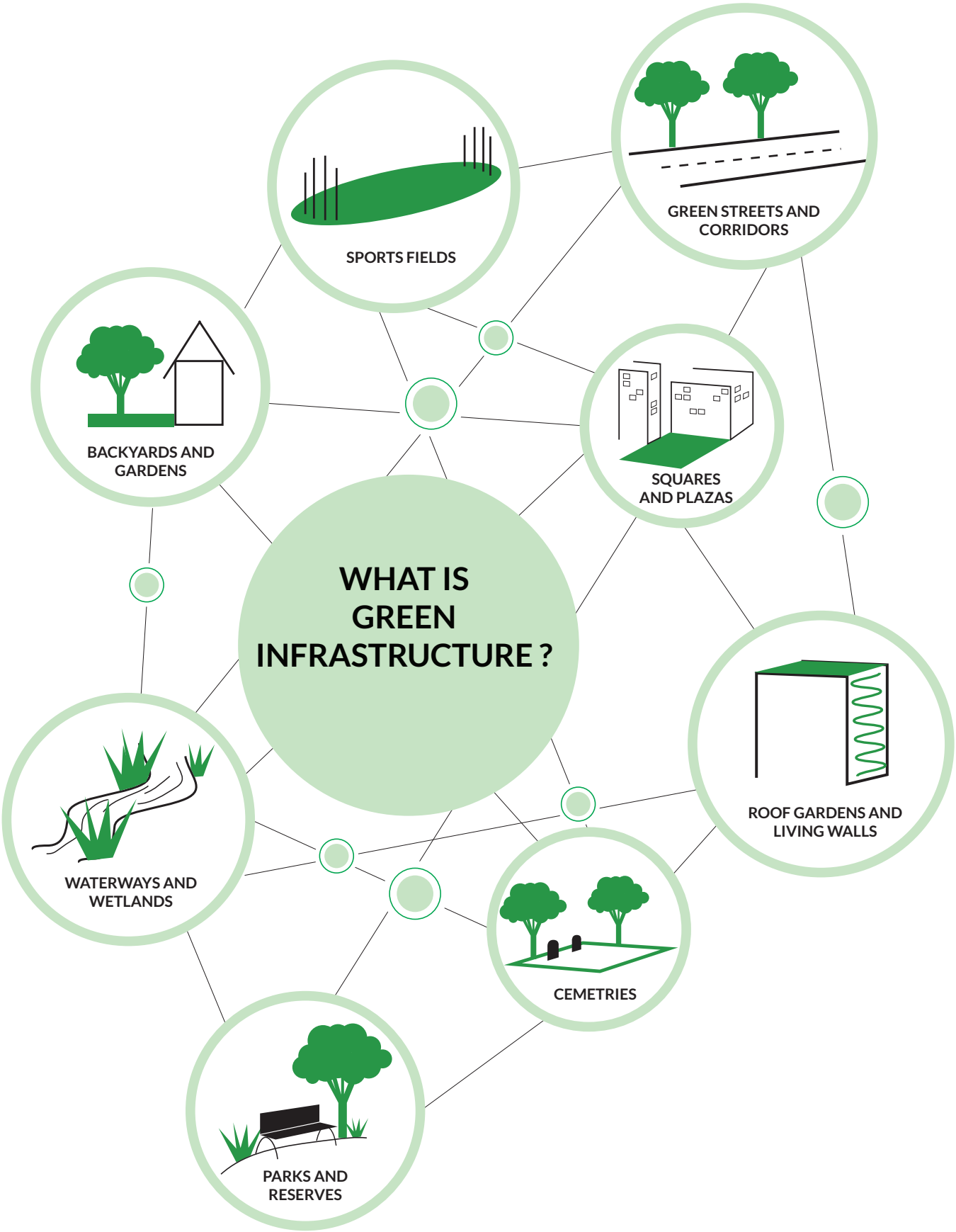


Figure 13: What is Green Infrastructure?

Image: Example of urban environment adjacent greenspace - Bendat Basketball Centre | Ecoscape

for the WESROC area. The prime mechanism through which nature is protected within cities is through the development of and protection of Green Infrastructure. According to Hobbs, "Nature Conservation: The role of corridors" 1990, without the connections between urban green spaces, isolated places have limited benefits for biodiversity, because dispersal and gene flow are restricted. The suburbs within the WESROC area have valuable mature trees and verge space that form part of the existing green links and infrastructure. Creating wildlife corridors and means for fauna to connect is beneficial for key species to move across urban environments. The Ecologic Institute and GHK Consulting, Berlin, firmly believe GI should be strategic and needs a "co-ordinated initiatives that focus on maintaining, restoring, improving and connecting existing areas and features, as well as creating new areas and features." Research demonstrates the importance of having a strategic green plan such as this strategy for WESROC.

Green infrastructure improving liveability

Green infrastructure also has economic benefits, by improving amenity it has potential to increase property values as well as improve consumer activity. These spaces are also a 'free service' that can support other economic activities such as recreation, sport and tourism. Public spaces along the Swan River, such as sporting ovals provide this service within WESROC. There is evidence that GI in urban environments benefit economically deprived communities more than others, therefore GI provided to these communities can create more equal socioeconomic conditions. The Victoria University, prepared a Green Paper for assessing the economic value of GI, and recorded that GI can also increase urban liveability and is increasingly being recognised as one of the main aspects contributing to liveability. By reducing climate impact related risk well designed GI can "lessen the physical, emotional and financial cost of damaging events". Correct land management and green infrastructure along the waterfront, both beach front and river front in WESROC provide a buffer against the effects of our changing climate and is therefore a valuable investment.

"Sensitively managing established urban areas adjacent to large areas of greenspace, is important to reduce negative effects on adjacent habitats".

"Key lessons for achieving biodiversity-sensitive cities and towns," Ecological Management & Restoration, vol. 16 2015

'Urban Edges'

Urban edges are a key area that GI has an impact on, within WESROC locations including Bold Park, Lake Monger and Bush Forever sites can be defined as 'wildland'. According to E. Arroyo (2000), "When development is configured in a manner that creates a high ratio of development edge to wildland, there is an increase in the potential impacts caused by human use". It is essential the interface between urban and wild provides a positive effect on the 'wild' side. Green links strategically placed adjacent to bush forever areas can become key migratory connections for these pockets that would otherwise become isolated.

GREENING PLAN 2002 OBJECTIVES & RECOMMENDATIONS

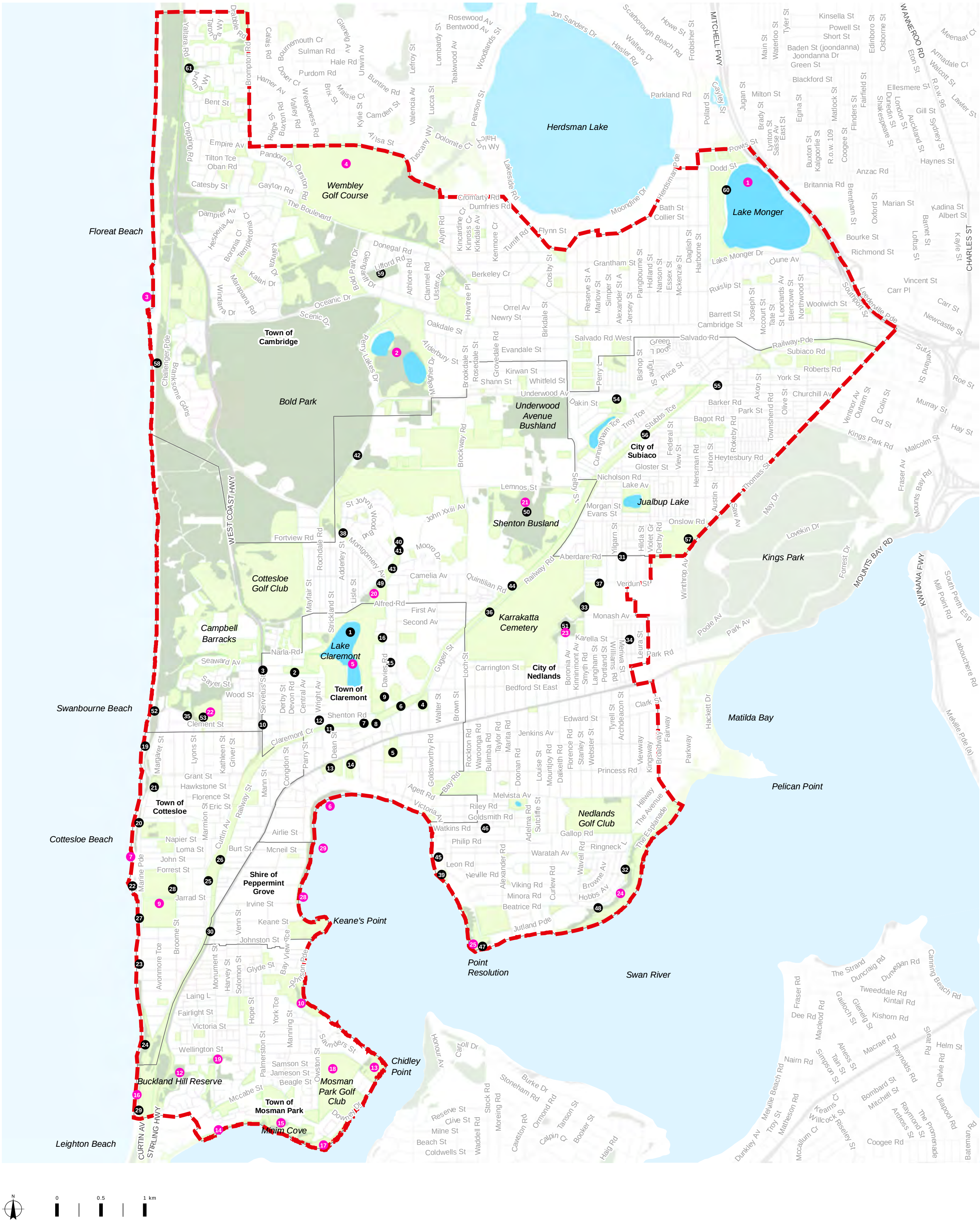
The following table outlines the original 2002 Greening Plan Objectives and Recommendations. Following the adoption of the WESROC Greening Plan in 2002, the LGA members of WESROC have been working towards these Objectives and Recommendations.

Table 4: 2002 Greening Plan Objectives & Recommendations

OBJECTIVE	RECOMMENDATIONS
Objective 1: Protection and Management of Existing Bushland	
1.1	Retain and improve, where possible, all existing bushland and wetlands found within the Western Suburbs.
1.2	Develop management plans for all major bushland and wetland areas within the Western Suburbs.
1.3	Encourage community involvement in the management of existing bushland. Ensure that adequate training is given to volunteer groups before undertaking restoration efforts.
Objective 2: Develop and Maintain Greenways	
2.1	Develop greenways in the order of regional linkages, securing linkages and developing linkages on local government managed land.
2.2	Develop and maintain greenways to encourage movement of native biota.
2.3	Develop partnerships with major land owners such as Main Roads WA, Westrail and Western Power to increase the ecological and aesthetic value of their land so they have the capacity to act as greenways.
2.4	Encourage individual, corporate and institution land owners to contribute to the greenway program through the development of ecological and aesthetic enhancement of their land.
2.5	Undertake detailed planning and design of greenway project sites.
Objective 3: Establishing Greenways on Publicly Owned Land	
3.1	Expanding Existing Bushland Areas: » *Where possible expand existing remnants through restoration of contiguous land.* » *Increase the quantity and quality of bushland adjoining existing remnants.* » *Develop demonstration sites that show the contiguous expansion of bushland through various restoration techniques.*
3.2	Greening Parkland Areas: » *Identify public open space areas that may contribute to greenway development* » *Prepare innovative designs for sites that demonstrate a distinctive sense of place for each area that embraces the unique characteristics of the environment.* » *Establish community ownership of parks through precinct groups, schools or friends of park groups.* » *Incorporate public art to create spaces with unique identities that create a sense of place and local community ownership.* » *Implement the greening and habitat enhancement of parts of public open space.* » *Demonstrate the use of primarily native flora in the design of public open space.*
3.3	Greening Coastal and River Foreshore Areas: » *Develop a continuous and contiguous greenway along the river foreshore and coastal areas.* » *Develop ecological and landscape designs that minimise conflicts with adjoining owners through their involvement in the design process.* » *Create interpretative displays that educate and inform the public about the environmental process in coastal areas, and the Aboriginal and European history of the areas.*
3.4	Greening Streetscapes: » *Use streetscapes as a means of connecting natural bushland areas* » *Increase the aesthetic and ecological values of existing streetscapes* » *Encourage community involvement in streetscape design* » *Develop demonstration sites that help create new precedents in streetscape design within the context of greenways* » *Develop designs and plans for different road and street hierarchies (taking account of public safety and design requirements) which incorporate greenway principals, the retention of existing trees and the involvement of the community in the process.*
3.5	Greening of Other Public Land: » *Work with relevant government land owners and departments to develop their land for greenway purposes.* » *Encourage the use of innovative design that meet sustainability measures in the greening of government land.*

Image: Herdsman Lake boardwalk | Sally Wallace

OBJECTIVE	RECOMMENDATIONS
Objective 4: Greening of Private Land	
4.1	Greening Residential Land: » *Encourage private residences adjacent to greenways to introduce indigenous vegetation into their property.* » *Encourage properties not directly related to the Greening Plan to vegetate their property with appropriate local species as this contributes to the amenity of the area.* » *Promote that all landowners have the opportunity to participate in and contribute to the creation of a more attractive and sustainable environment.* » *Encourage the development of planting plans which provide appropriate indigenous species and incorporate any existing significant vegetation.* » *Promote planting lists of appropriate flora for private property abutting major greenways to maximise the width of greenways and include requirements for appropriate landscape plans into future major development approvals.*
4.2	Greening Residential Institutions and Corporations: » *Involve educational institutions, corporations and businesses in the implementation of the greening plan.* » *Involve school and tertiary institutions in the monitoring and evaluation of the greenways program.* » *Provide formal recognition, assistance and planning and resources to participating Institutes.* » *Involve students in projects to educate them in all aspects of the Greening Plan.*
Objective 5 : Community Education, Awareness and Involvement	
5.1	Develop a community awareness and involvement program for the Western Suburbs Greening Program.
5.2	Actively involve the community in green plan initiatives.
5.3	Provide literature and support to land owners who wish to undertake greening initiatives particularly within greenway priority areas.



LEGEND

WESROC Greening Projects

- Planning Document
- On-ground Implementation
- WESROC Boundary
- Local Government Boundaries
- Waterbodies

Vegetation Classification

- High Density - Bushland
- Open Space

Figure 14: Greening Projects since 2002

Table 5: List of WESROC Actions and Locations

Please read in conjunction with Figure 14.

ON-GOUND IMPLEMENTATION PROJECTS (shown on Figure 14)

Number	Action	LGA
1	Revegetation project Lake Claremont	Town of Claremont
2	Revegetation project at McKenzie Bush	Town of Claremont
3	Revegetation project at Servetus Street	Town of Claremont
4	Revegetation project at Rowe Park	Town of Claremont
5	Revegetation project at Claremont Park	Town of Claremont
6	Greenways developed at Shenton Road	Town of Claremont
7	Greenways developed at Claremont Crescent	Town of Claremont
8	Greenways developed at Gugeri Street	Town of Claremont
9	Greenways developed at Davies Road	Town of Claremont
10	Greenways developed at Servetus Street	Town of Claremont
11	Greenways developed at Barnfield Road	Town of Claremont
12	Encouraging Scotch College to undertake landcare activities within their school grounds.	Town of Claremont
13	Encouraging Methodist Ladies College to undertake landcare activities within their school grounds.	Town of Claremont
14	Encouraging ChristChurch Grammar to undertake landcare activities within their school grounds.	Town of Claremont
15	Restoration of garden beds at Motteram Ave Park	Town of Claremont
16	Restoration of garden beds at Mulder Park	Town of Claremont
17	Restoration of garden beds at Maclagan Park	Town of Claremont
18	Restoration of garden beds at Mackenzie Bushland	Town of Claremont
19	Greenways developed/ maintained Dunes between Swanbourne boundary and N9 beach access path	Town of Claremont
20	Greenways developed/ maintained Dunes between Cottesloe Main beach and Grant Street	Town of Cottesloe
21	Greenways developed/ maintained Grant Marine Park	Town of Cottesloe
22	Greenways developed/ maintained Mudurup Rocks	Town of Cottesloe
23	Greenways developed/ maintained Dunes between Dutch Inn Groyne and Salvado Street	Town of Cottesloe
24	Greenways developed/ maintained Sydney Street dunes to Mosman Park Boundary (includes Vlamingh)	Town of Cottesloe
25	Greenways developed/ maintained Grant Street and Curtin Avenue (road reserve along train line)	Town of Cottesloe
26	Greenways developed/ maintained Railway Road and carpark (road reserve along the train line)	Town of Cottesloe
27	Locations of Native tree nodes along the Cottesloe Foreshore	Town of Cottesloe
28	Greenways maintained Cottesloe Native Garden	Town of Cottesloe
29	Restoration of Mosman Beach dunes	Town of Mosman Park
30	Planting Agonis flexuosa along Stirling Highway verges within the SPG jurisdiction as per Transit Reserve greening plan.	Shire of Peppermint Grove
31	Greenways developed on Aberdare Road	City of Nedlands
32	Greenways developed on Birdwood Parade	City of Nedlands
33	Greenways developed on Smyth Road	City of Nedlands
34	Greenways developed on Karella Street	City of Nedlands
35	Greenways developed on Odern Crescent	City of Nedlands
36	Greenways developed on Railway Road	City of Nedlands
37	Greenways developed on Verdun Street	City of Nedlands
38	Greenways developed on Montgomery Avenue	City of Nedlands
39	Greenways developed on Bishop Rd Reserve	City of Nedlands
40	Greenways developed on Heritage Lane	City of Nedlands
41	Greenways developed on Mooro Park	City of Nedlands
42	Greenways developed on Stephenson Avenue	City of Nedlands
43	Greenways developed on Pine Tree Park	City of Nedlands
44	Greenways developed on Stubbs Terrace	City of Nedlands
45	Greenways developed on Waratah Place	City of Nedlands
46	Greenways developed on Watkins Road	City of Nedlands
47	Revegetation at Point Resolution	City of Nedlands
48	Revegetation at Birdwood Parade	City of Nedlands
49	Revegetation at Mt Claremont Oval Bushland	City of Nedlands
50	Revegetation at Shenton Bushland	City of Nedlands
51	Revegetation at Hollywood Reserve	City of Nedlands
52	Revegetation at Swanbourne Dunes	City of Nedlands
53	Revegetation at Allen Park	City of Nedlands
54	Jolimont Primary to protect and enhance remaining bushland on the school site	City of Subiaco
55	Hay Street median islands greenways project undertaken.	City of Subiaco
56	Rail Corridor Greenway – Nash Street to Hay street both sides of rail reserve planted and maintained as greenways. Hadyen Bunton Drive to Thomas street works ongoing.	City of Subiaco
57	Rosalie Park regional greenway establishment.	City of Subiaco
58	Ongoing restoration of coastal dunes	Town on Cambridge
59	Revegetation and Verge planting of trees	Town on Cambridge
60	Extensive regenerative works undertaken at Lake Monger	Town on Cambridge
61	Grass and mono-culture of Acacia removed and 1500 native seedlings planted	Town on Cambridge

PLANNING DOCUMENTS (shown on Figure 14)

Map No.	Document	LGA
1	Lake Monger Reserve Management Plan	Town of Cambridge
2	Perry Lakes Reserve Management Plan	Town of Cambridge
3	The Coastal Dunes Management Plan	Town of Cambridge
4	Wembley Golf Complex Management Plan	Town of Cambridge
5	Management Plan for Lake Claremont, updated plan for 2016-2021	Town of Claremont
6	Management Plan for Foreshore	Town of Claremont
7	Cottesloe Natural Areas Management Plan 2008	Town of Cottesloe
8	Cottesloe Natural Areas Management Plan, Addendum 1 2015	Town of Cottesloe
9	Sea View Golf Club Management Plan (2012)	Town of Cottesloe
10	Bay View Park Environmental Management Plan 2009	Town of Mosman Park
11	Bay View Park Revegetation Plan 2010	Town of Mosman Park
12	Buckland Hill Conservation Management Plan (2019)	Town of Mosman Park
13	Chidley Point Reserve MP 2018	Town of Mosman Park
14	Garungup Reserve Environmental Management Plan 2018	Town of Mosman Park
15	South Mosman Park Bushland Management Plan 2009	Town of Mosman Park
16	Mosman Beach Management Plan 2003	Town of Mosman Park
17	Point Roe Management Plan 2019	Town of Mosman Park
18	Mosman Park Golf Club Environmental Management Plan	Town of Mosman Park
19	Monument Hill Revitalisation Plan	Town of Mosman Park
20	Mount Claremont Oval Reserve Management Plan 2013 (revised 2019-2024)	City of Nedlands
21	Draft Shenton Bushland Management Plan 2019 – 2024	City of Nedlands
22	Draft Allen Park Bushland Management Plan 2019 – 2024	City of Nedlands
23	Draft Hollywood Reserve Management Plan 2019 – 2024	City of Nedlands
24	Draft Birdwood Parade Management Plan 2019 – 2024	City of Nedlands
25	Draft Point Resolution Bushland Management Plan 2019 – 2024	City of Nedlands
28	Foreshore Environmental Management Plan May 2015	Shire of Peppermint Grove
29	WESROC Foreshore Management Plan May 2016	Shire of Peppermint Grove

WHAT'S HAPPENED SINCE 2002?

The members of WESROC have undertaken a considerable number of projects and actions aligned with the Greening Plan 2002 objectives and recommendations. The following pages describe the actions and projects undertaken by WESROC member council for each objective.

Table 6: 2002 Objective 1 Protection and Management of Existing Bushland

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Objective 1: Protection and Management of Existing Bushland	
Town of Cambridge	» *Biodiversity Action Plan 2011-2015 developed in 2011. Update for 2016-2020 currently drafted.* » *Management plans in place for Lake Monger Reserve, Perry Lakes Reserve, The Coastal Dunes and Wembley Golf Complex. All other natural areas are managed under the Biodiversity Action Plan.* » *Three community groups active within the Town, the latest formed in 2016.*
Town of Claremont	» *Revegetation projects at Lake Claremont, McKenzie Bush, Servetus Street, Rowe Park and Claremont Park.* » *Management Plan for Lake Claremont.* » *Management Plan for Foreshore.* » *Assist FOLC with technical support and guidance.* » *Mofflin to Second Ave verge garden.* » *Claremont Cresecent verge gardens.* » *Gugeri Street verge gardens.* » *Lake Claremont vegetation buffer complete.*
Town of Cottesloe	» *Cottesloe Natural Areas Management Plan (2008).* » *Cottesloe Natural Areas Management Plan, Addendum 1 (2015).* » *Cottesloe Coastcare Association are actively involved in the management of coastal reserves and other natural areas in the Town.* » *Revegetation projects along coastal sites.*
Town of Mosman Park	» *All Mosman Park owned bushlands are managed for conservation.* » *Existing Management Plans for:* - *Bay View Park Environmental Management Plan (2009)* - *Bay View Park Revegetation Plan (2010)* - *Chidley Point Reserve MP (2011) – due to be updated in 2017* - *Chidley Point Reserve Management Plan (2018)* - *South Mosman Park Bushland Management Plan (2009)* - *Point Roe Management Plan (2019)* - *Mosman Beach Management Plan (2003).* » *One active 'Friends Of' volunteer group (Friends of Mosman Park Bushland) and encouraging others to be developed through developing a Friends Group User Manual. The current Friends Group is given training opportunities and funding to purchase equipment and resources.*
City of Nedlands	» *All Nedlands owned bushlands managed for conservation.* » *New management plan developed for Mount Claremont Oval Reserve (2013) and all existing bushland management plans reviewed and updated in 2013.* » *Five community groups active within Nedlands reserves (including one new group est. 2007).* » *Greenways Policy 2001 (updated 2012 and 2017).*
Shire of Peppermint Grove	» *SPG Foreshore Environmental Management Plan May 2015 (Natural Area Consulting).* » *WESROC Foreshore Management Plan May 2016 (Seashore Engineering).*
City of Subiaco	» *All Subiaco owned bushland managed for conservation – Now in the City of Perth.* » *Working with Jolimont Primary to protect and enhance remaining bushland on the school site. Federal government grants received for works.* » *City of Subiaco Environmental Volunteers group works in bushland and green corridor areas.* » *Regular dieback treatment and mapping of all reserves in the city to protect existing values.* » *City of Subiaco Wildlife Enhancement Plan.* » *City of Subiaco Plant Pathogen Management Plan.* » *City of Subiaco Environmental Enhancement Plan 2012-2016.*

Table 7: 2002 Objective 2 Develop and Maintain Greenways

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Objective 2: Develop and Maintain Greenways	
Town of Cambridge	» *Continue revegetation of coastal dunes and Lake Monger, Roscommon Park. Verge planting of trees.* » *Monitor and maintain existing greenways through weed control and infill planting.* » *Partnership opportunities being investigated eg. with Water Corporation.* » *Native Plant Subsidy Scheme.* » *Implement actions under Lake Monger Rehabilitation Plan, Western Side of the Lake.*
Town of Claremont	» *Greenways developed at Shenton Road, Claremont Crescent, Gugeri Street, Davies Road, Servetus Street and Barnfield Road.* » *Encouraging Scotch College, ChristChurch Grammar and Methodist Ladies College to undertake landcare activities within their school grounds.*
Town of Cottesloe	» *MOU with PTA signed 2008.* » *Greenways developed/ maintained:* - *Dunes between Swanbourne boundary and N9 beach access path* - *Dunes between Cottesloe Main beach and Grant Street* - *Grant Marine Park* - *Mudurup Rocks* - *Dunes between Dutch Inn Groyne and Salvado Street* - *Sydney Street dunes to Mosman Park Boundary (includes Vlamingh)* - *Grant Street and Curtin Avenue (road reserve along train line)* - *Railway Road and carpark (road reserve along the train line)* » *Railway corridor Greening plan created as a landscaping design for the new Principal Shared Path (2019).* » *Street tree policy updated (2019) – ensures a minimum of one tree is planted per verge adjacent to each residential property, including new developments.* » *Locations of Native tree nodes along the Cottesloe Foreshore determined and planted as a trial for more tree nodes.*
Town of Mosman Park	» *The Town has good local bushland linkages, especially between Garungup Park, Minim Cove and Point Roe Park along the river.* » *The restoration of Mosman Beach dunes in stages has significantly improved the visual amenity of the beach, as well as providing habitat for local fauna.* » *The Town has facilitated a Environmental Management Plan for the local Golf Club to use and follow.* » *The Town has a couple of community verge gardens maintained by a collection of residences.* » *The Vlamingh Parklands (1998).* » *Memorandum of Understanding with the Public Transport Authority of WA, signed 2008.* » *Street Tree Masterplan (2019).*
City of Nedlands	» *MOU with PTA signed 2008.* » *Greenways developed:* - *Aberdare Road, Birdwood Parade, Smyth Road, Karella Street,Odern Crescent, Railway Road, Verdun Street, Montgomery Avenue, Bishop Rd Reserve, Heritage Lane, Mooro Park, Stephenson Avenue, Pine Tree Park, Stubbs Terrace, Waratah Place and Watkins Road.* - *coastal and river foreshore greenways developed and enhanced.*
Shire of Peppermint Grove	» *Planting agonis flexuosa along Stirling Highway verges within the SPG jurisdiction as per Transit Reserve greening plan.*
City of Subiaco	» *MOU with PTA signed 2008.* » *Hay Street median islands greenways project undertaken.* » *Rail Corridor Greenway – Nash Street to Hay street both sides of rail reserve planted and maintained as greenways. Hadyen Bunton Drive to Thomas street works ongoing.* » *Rosalie Park regional greenway establishment.* » *City of Subiaco Wildlife Enhancement Plan.* » *City of Subiaco Plant Pathogen Management Plan.* » *City of Subiaco Environmental Enhancement Plan 2012-2016.* » *City of Subiaco Sustainability and Resilience Strategy 2016-2021.*

Table 8: 2002 Objective 3 Establishing Greenways on Publicly Owned Land

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Objective 3: Establishing Greenways on Publicly Owned Land | Expanding Existing Bushland Areas	
Town of Cambridge	» *Rehabilitation works undertaken at the at the coastal dunes, Challenger Park, Chipping Park, Fred Burton Park, Roscommon Park, The Quarry Amphitheatre, and Templetonia Park.*
Town of Claremont	» *Revegetation projects at Lake Claremont, McKenzie Bush, Rowe Park, Claremont Park and Claremont foreshore.* » *Bradley method of revegetation has been used as a guiding principle for all restoration works.*
Town of Cottesloe	» *Cottesloe Native Garden – weed eradication and replanting.* » *Increased dune system restoration works including weed control, erosion control and revegetation with native seedlings to create habitat linkages in northern, central and southern coastal sites.* » *Demonstration sites exist on the foreshore between the main beach and North Cottesloe SLSC where all dunes have undergone restoration works over a number of years.*
Town of Mosman Park	» *Minim Cove Park's Bushblock project to protect a patch of remnant bushland.* » *Conversion of grass into bushland to expand bushland buffer at Minim Cove Park.* » *Revegetation and erosion control at the Mosman Beach dunes.* » *Revegetation of Beehive Montessori School verge (2015 and further expansion in 2017).* » *Conversion of weedy carpark verge at Mosman Beach into native bushland.* » *Christ Church Grammar School 'Chidley Sanctuary' project – on-going conservation maintenance of a section of bushland with the students since 2008.*
City of Nedlands	» *Point Resolution Greenway Buffer project.* » *Degraded edges of bushlands restored.* » *Flyash Hill Greenway linkage Project.* » *Artistic limestone wall murals project (Friends of Allen Park and Swanbourne Primary School).* » *Nedlands library native garden project.* » *Shenton Bushland "Barrens Project".* » *Swanbourne Primary bushland revegetation project.* » *David Cruickshank ecozone project.*
Shire of Peppermint Grove	» *Planting and hydrozoning along Freshwater Bay Foreshore Bush Forever site.*
City of Subiaco	» *Jolimont Primary bushland area expanded to include green corridor linkages.* » *Rosalie Primary School Greenway planting around school site.* » *Direct seeding trial undertaken along rail reserve to trial different restoration techniques.*
Objective 3: Establishing Greenways on Publicly Owned Land | Greening Parkland Areas	
Town of Claremont	» *FOLC are a registered non for profit organisation.* » *FOLC are now a registered tax deductible organisation.* » *FOLC membership has increased dramatically over the last ten years.* » *A number of art installations at the Lakeway subdivision.* » *WESROC Whadjuk trails provide signage about the Noongar and natural history of the local area.*
Town of Cottesloe	» *Draft concept plan for John Black Dune Park (2014) and Railway corridor Greening plan created as a landscaping design for the new Principal Shared Path (2019).* » *Concept design for a nature discovery scape near Vlamingh in a restoration site (2019).* » *Cottesloe Coastcare Association are actively involved in the management of coastal reserves and other natural areas in the Town.* » *The Town supports local primary schools in tree planting activities and participation in National Tree Day.* » *Installation of sculptures purchased from 'Sculpture by the Sea' exhibition.* » *All natural areas are restored using native coastal tubestock.*

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Town of Mosman Park	» *Continuous revegetation along the river foreshore extending from Garungup Park, Minim Cove and Chidley Point Reserve.* » *Interpretative signage installed along Garungup Reserve, Minim Cove and Point Roe Park as part of the Wadjuk Trails network along the coast and river foreshore. Meandering limestone pathways through Garungup Reserve, Boardwalk at Point Roe Park and other pathways to encourage the community to visit and explore the bushland. And in 2015, with assistance from the Mosman Park Men's Shed and Nature Play Australia, constructed an Adventure Play Playground at Minim Cove Park.* » *Regular community and school engagement throughout the year at a number of bushland areas (CCGS, Beehive Montessori, PLC, Scotch College, St Kilda's, Swan Canoe Club, FoMPB).* » *Dragonfly Statue at Bay View Park and proposed sculpture at Chidley Point Reserve to be installed in 2016 or early 2017.* » *Nature Strips Policy & 'Residents Guide to Designing a Sustainable Nature strip' developed (current under review and to be updated). The Street Tree Policy and Guidelines is also under review to be updated. Annual WESROC Native Plant Subsidy Scheme.*
City of Subiaco	» *City of Subiaco Hydrozoning policy.* » *Cliff Sadlier Reserve Cockatoo food planting project in collaboration with Birdlife Australia.* » *Mabel Talbot Reserve Cockatoo food planting project in collaboration with Birdlife Australia.* » *Mabel Talbot bird signage project in collaboration with Birdlife Australia.* » *Jersey street park nature play and greenway plantings.* » *Dom Serra grove verge greenway planting.* » *Rosalie Park green ways developed.* » *Mueller park greenways and hydrozone areas.* » *Cliff sadlier reserve Native demonstration garden.*
Objective 3: Establishing Greenways on Publicly Owned Land | Greening Coastal and River Foreshore Areas	
Town of Cambridge	» *Ongoing restoration of the coastal dunes.* » *Interpretative signage installed at Roscommon Park and Lake Monger. Interpretive signage also installed along the Bush to Beach trail and Yange Kep Bidi Trail, both part of the Wadjuk trails network.*
Town of Cottesloe	» *Greenways developed/ maintained:* - *Dunes between Swanbourne boundary and N9 beach access path* - *Dunes between Cottesloe Main beach and Grant Street* - *Grant Marine Park* - *Mudurup Rocks* - *Dunes between Dutch Inn Groyne and Salvado Street* - *Sydney Street dunes to Mosman Park Boundary (includes Vlamingh).* » *Interpretive signage installed along Cottesloe dunes, Grant Marine Park and as part of the Wadjuk Trails, Bush to Beach, network along the coast. Plant specie signs at the C2 site.*
Town of Mosman Park	» *Regular revegetation projects along the river foreshore and Mosman Beach to improve condition and quality of bushland/ greenways.* » *Try our best to accommodate and assist residents interested in caring and restoring bushland adjacent to their properties. We plant low-lying species where possible so not to impact on residents views of the Swan River and promote harmonious relationships.* » *The Town has been successful with securing Coastwest Funding (WAPC) in years 2011-2014 and 2016 where the community has played an important role and shown much interest. Informational signage has been installed across most bushland reserves to educate visitors on history and significance (Mosman Park Heritage Trail).* » *Street Tree Masterplan (2019).*
City of Nedlands	» *Excess of 10 greening projects undertaken along the Swan River Foreshore in collaboration with DBCA.* » *Excess of 7 greening projects undertaken along the Coastal Greenway in conjunction with the WAPC and the Australian Governments Caring for our Country program.* » *Interpretive signage installed along Swanbourne Dunes and as part of the Wadjuk Trails network along the coast and river foreshore.* » *Annual street tree planting program.*
Objective 3: Establishing Greenways on Publicly Owned Land | Greening Streetscapes	
Town of Cambridge	» *Updated verge policy with encouragement for native verges.* » *Conversion of grass medians to native plantings along Oceanic Dve and The Boulevard.*
Town of Claremont	» *Approved Street Tree Masterplan.* » *Waterwise Council.* » *WESROC native plant subsidy scheme.*

Image: Mosman Park Minim Cove | Ecoscape

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Town of Cottesloe	» *Annual WESROC Native Plant Subsidy Scheme.* » *Street tree policy updated (2019) – ensures a minimum of one tree is planted per verge adjacent to each residential property, including new developments.* » *Native waterwise verge rebate available for residents who covert grass verge to native plants.* » *Demonstration gardens at the corners of:* - *Eric Street and Curtin Avenue; Grant Street and Marine Parade; Railway Street near Albion Street; Napier Street near Broome Street; the Grove Library.* » *Locations of Native tree nodes along the Cottesloe Foreshore determined and planted as a trial for more tree nodes.*
Town of Mosman Park	» *The Town's Nature Strip Policy & Guide + Streetscape Policy and Guidelines are currently under review and due to be updated. The community has already shown strong interest in being involved in the recreation of this and it's clearly a topic they are passionate about. We promote water efficient verges (and promote Water Corps Guide to Waterwise Verges) and encourage residents to plant native species in their gardens and verges where possible. The Water Corp recently offered Councils the opportunity to have their Nature Strip/Verge Guidelines reviewed by a consultant, so we have direction as to where we can improve.*
City of Nedlands	» *Streetscapes revegetated at numerous locations.* » *Annual WESROC native Plant Subsidy Scheme.*
City of Subiaco	» *Annual WESROC native Plant Subsidy Scheme.* » *City of Subiaco Verge Development Assistance program.* » *Western Suburbs Greening Plan Guide.* » *City of Subiaco Street tree planting program and street tree policy.* » *Interpretive signage installed in parkas and reserves as part of the Wadjuk Trails network along the coast and river foreshore.* » *City of Subiaco Wildlife Enhancement Plan.* » *City of Subiaco Plant Pathogen Management Plan.* » *City of Subiaco Environmental Enhancement Plan 2012-2016.* » *City of Subiaco Sustainability and Resilience Strategy 2016-2021.*
Objective 3: Establishing Greenways on Publicly Owned Land | Greening of Other Public Land	
Town of Cottesloe	» *Railway corridor Greening plan created as a landscaping design for the new Principal Shared Path (2019).*
Town of Mosman Park	» *Most of the bushland areas found in the Town are owned and managed by the Town. Small pockets (particular Buckland Hill) are owned by the Water Corporation and Public Transport Authority. We are beginning to work collaboratively to ensure these areas are maintained and cared for.*
City of Nedlands	» *Two state government reserves co-managed with funding provided to the City (one at Allen Park in conjunction with the Department of Defence and one at Shenton Bushland in conjunction with the Department of Health).*

Table 9: 2002 Objective 4 Greening of Private Land

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Objective 4: Greening of Private Land | Greening Residential Land	
Town of Cambridge	» *Promotion of the WESROC Native Plant Subsidy Scheme through scheme advertising and native gardening workshops.*
Town of Claremont	» *WESROC native plant subsidy.* » *TOC Verge Policy and guidelines.* » *WESROC Greening Plan.*
Town of Cottesloe	» *Annual WESROC Native Plant Subsidy Scheme.* » *Native waterwise verge rebate available for residents who covert grass verge to native plants.* » *Community events: native garden workshop.* » *'Safeguarding our Water Supplies' forum.* » *'Protecting our Urban Forests' forum.* » *Town of Cottesloe Residential Verges Policy.* » *Town of Cottesloe Street Trees Policy.* » *'Coastal Gardens' booklets and pamphlets.* » *Information on suitable planting species available on the Town's website.*
Town of Mosman Park	» *Annual WESROC native Plant Subsidy Scheme.* » *Town of Mosman Park Nature Strips Policy & Guide to Sustainable Verge.* » *Western Suburbs Greening Plan Guide.* » *The Town is in the process of developing a letter/document for residents who live adjacent to bushland areas to encourage native plants (and even better, choosing species from the Enviro Mgmt Plan for the site).*
City of Nedlands	» *Annual WESROC native Plant Subsidy Scheme.* » *City of Nedlands Greenways, Water Wise Gardens and Nature Strips Policy.* » *Western Suburbs Greening Plan Guide.*
City of Subiaco	» *Annual WESROC native Plant Subsidy Scheme.* » *City of Subiaco Verge Development Assistance program.* » *Western Suburbs Greening Plan Guide.* » *Rosalie Primary school greenway planting events and monitoring via vegetation transects as part of the science curriculum.* » *Jolimont Primary school greenway planting events.* » *City of Subiaco Wildlife Enhancement Plan.* » *City of Subiaco Plant Pathogen Management Plan.* » *City of Subiaco Environmental Enhancement Plan 2012-2016.* » *City of Subiaco Sustainability and Resilience Strategy.*
Objective 4: Greening of Private Land | Greening Residential Institutions and Corporations	
Town of Cottesloe	» *The Town supports local primary schools in tree planting activities and participation in National Tree Day.* » *Identified in revegetation plans developed under the Biodiversity Action Plan.* » *Waterwise garden award category in the TOC Garden Awards- covers residential and commercial properties.* » *Annual Arbor Day planting with local primary schools*
Town of Mosman Park	» *The Greening Plan 2002 was advertised amongst the community and schools when it was launched.*

Table 10: 2002 Objective 5 Community Education, Awareness and Involvement

WESROC MEMBER	ACTIONS & COMPLETED PROJECTS
Objective 5 : Community Education, Awareness and Involvement	
Town of Cambridge	» *Promotion of the WESROC Native Plant Subsidy Scheme through scheme advertising, native gardening workshops and National Tree Day.*
Town of Claremont	» *Annual WESROC native Plant Subsidy Scheme.* » *TOC verge Policy and guidelines.* » *Western Suburbs Greening Plan Guide.*
Town of Cottesloe	» *Annual WESROC Native Plant Subsidy Scheme.* » *Community events: native garden workshop.* » *'Safeguarding our Water Supplies' forum.* » *'Protecting our Urban Forests' forum.* » *Town of Cottesloe Residential Verges Policy .* » *Town of Cottesloe Street Trees Policy.* » *'Coastal Gardens' booklets and pamphlets.* » *Information on suitable planting species available on the Town's website.* » *Other organisations providing on-ground assistance through Cottesloe Coastcare Association including schools, universities and corporate organisations.*
Town of Mosman Park	» *Annual WESROC Native Plant Subsidy Scheme.* » *Town of Mosman Park Nature Strips Policy & Guide to Sustainable Verge.* » *Western Suburbs Greening Plan Guide.*
City of Nedlands	» *Annual WESROC native Plant Subsidy Scheme.* » *City of Nedlands Greenways, Water Wise Gardens and Nature Strips Policy.* » *Western Suburbs Greening Plan Guide.* » *National Tree Day.* » *Clean up Australia Day.* » *Bushcare Major Day Out events held annually.*
City of Subiaco	» *Annual WESROC native Plant Subsidy Scheme.* » *City of Subiaco Water wise, Native and bushfood gardening workshops held annually.* » *City of Subiaco verge development assistance program.* » *Western Suburbs Greening Plan Guide.* » *Rosalie Primary, Subiaco primary, Jolimont Primary, Perth Modern school nest box building, installation and monitoring project.* » *National Tree Day Community greenway establishment planting events held annually.* » *Sustainable Verge and Garden awards promote sustainable landscape choices that meets the intents of the greening plan.*

Image: Subiaco Primary School Planting Day | https://subiacops.wa.edu.au/project/national-tree-planting-day-2019/
Image p60 top: Friends of Shenton Bushland | City of Nedlands
Image p60 centre left: Arbor Day tree planting ceremony | Town of Cambridge
Image p60 centre right: Cottesloe Coastcare Corporate Days | Taurus
Image p60 bottom: Friends of Lake Claremont | Urban Bushland Council WA

4.0 WESROC GREENING PLAN 2020-2025

OBJECTIVES

Objective 1 | Protection and Management

The Western Suburbs has a number of important remnant vegetation areas, coastal environments, waterways and wetlands that provide the region with high natural conservation values. Much of this land is in reserves vested with either local or state government. Other lands which contain bushland is in private or institutional hands.

One of most important aspects of the Greening Plan is to protect and manage those areas of extant vegetation and wetlands. These areas provide most of the biodiversity found within the region and therefore require protection. Further loss of this resource will diminish the regions natural values and compromise the restorative capacity of degraded areas.

For those areas which have moderate to high conservation values but are still in either private or government or institutional hands strategies need to be developed to ensure that as far as possible the land is managed for conservation purposes.

For those areas already vested with Local Government for conservation purposes the main issues are to do with appropriate management.

Some of the main management issues that need to be addressed include the following:

- **Fire Control** | limiting arson events through education, fuel reduction measures eg weed control, response time, neighbourhood watch and fire breaks.
- **Weed Control** | management of major invasive weeds, revegetate areas where weeds have been removed.
- **Access Control** | rationalising the number of tracks, removing weeds, determining appropriate track sizes, appropriate fencing and gates.
- **Water quality and quantity management** | managing water levels, managing nutrient inputs, managing on a catchment scale.
- **Feral Animal Control** | control feral animals eg foxes, rabbits etc through trapping and baiting programs.
- **Domestic Pets** | manage cats through curfews if possible and manage other pets eg dogs on leashes.
- **Disease** | manage disease through good hygiene practices and inoculation procedures.
- **Restoration of Degraded areas** | restore degraded areas of bushland through appropriate bushland restoration techniques

Environmental Management Plans

In order to undertake staged and appropriate management of natural areas an Environmental Management Plan is usually prepared. This document defines the biophysical and cultural attributes of the site and the major environmental issues. Strategies and recommendations are then developed for the main environmental issues. A staged works program is developed for the term of the management plan (usually five years) along with budget requirements. Community involvement in the preparation of the management plan is important.

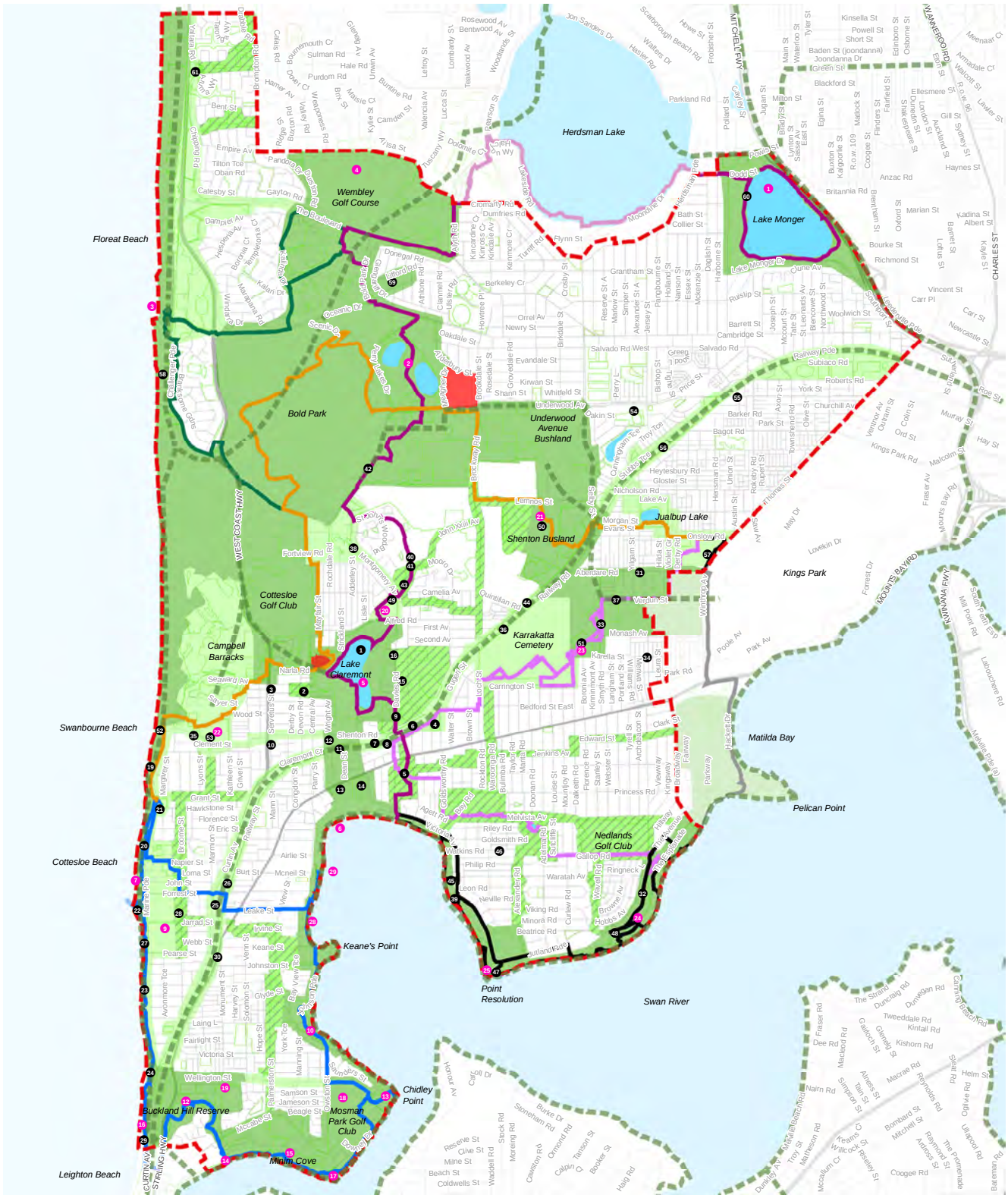
Such plans have been developed for many of the bushland areas in the Western Suburbs. In particular those reserves vested with either local government or state government have environmental management plans to direct future management of the conservation values of these bushland remnants.

Bushland on private land, on the other hand, is generally not managed with such a plan. These areas are most likely at threat because of the potential impacts arising through poor planning and management.

Objective 1 | Targets

The following targets have been redefined for Objective 1 based on the 2002 Targets.

- Retain and improve, where possible, all existing bushland and wetlands found within the Western Suburbs.
- Ensure Management Plans for bushland and wetlands are reviewed and updated when required and include an avenue for Aboriginal custodians to have proactive and holistic input into the review and development.
- Develop a strategy to identify where greenways can be linked across council boundaries within the Western Suburbs.
- Work with Government agencies, leasees and land owners to protect remnant bushland within their management control.



LEGEND

WESROC Greening Projects
- Planning Document
- On-ground Implementation
- Perth Metropolitan Regional Greenways
- WESROC Boundary
- Waterbodies
- Developed since 2002
- Open Space

Whadjuk Trails
- Bush to Beach
- Wardun Beelier Bidi
- Yange Kep Bidi
- Karda Bidi
- Karak Bidi
- Bidi Bo Djinoong (unmarked)

Western Suburbs Greenways
- Regional greenway - link between significant bushland, coastal, riverine, wetland habitats
- Securing greenway - link between locally significant bushland and extending regionally significant bushland.
- Developing greenways - link between open space, parks and recreation areas to remnant bushland.

Figure 15: 2020-2025 WESROC Greening Plan

Objective 2 | Expanding Greenways

Ecologically, greenways are important simply because they protect the integrity of natural areas. They provide habitat for flora and fauna and can play a key role in allowing wildlife to move between habitat areas that would otherwise be isolated to meet daily or seasonal needs. Enhancing connectivity may also increase the long term health of populations by increasing genetic exchange and by maintaining natural demographic processes, such as recolonisation following local extinctions. Because greenways have a high ratio of edge to interior, they are very exposed to surrounding elements. Edge effects such as the invasion of weeds can limit the effectiveness of corridors. Some greenways may also have limitations as movement corridors if they are severed by roads.

Social benefits of greenways include increased aesthetic appeal of the urban landscape; recreational use for cyclists, runners and walkers; adds to the sense of history and culture that is important to people's sense of place and increases community ties by linking parks, historical sites, residential areas, and shopping districts.

Greenways should be developed by revegetation using predominantly local native species in the species proportion and densities required for fauna. This will increase habitats for native fauna and encourage their movement between bushland areas.

Parts of the Western Suburbs have a high urban density which limits opportunities for creating greenways that provide suitable habitat for terrestrial fauna due to the lack of area available for revegetation and the highly fragmented nature of the urban environment. However in other parts the suburbs contain large street verges and private garden which could potentially contribute habitat value for some mammals (eg bats), birds, reptiles, amphibians, and insects.

Objective 2 | Targets

The following targets have been redefined for Objective 2 based on the 2002 Targets.

- Maintain and, where possible, increase greenways linking and engaging with living water to encourage movement of local endemic biota and to create regional linkages within and between local government managed land.
- Expand the greenway program by partnering with individual, corporate and institutional land owners or leasees to enhance the ecological and aesthetic characteristics of their land to support greenway development.

Objective 3 | Greening Public Open Space

Expanding Existing Bushland Areas

Areas that are set aside for conservation value such as Birdwood Parade and Point Resolution contain land within the reserve and adjoining it that is often degraded and unused. For example road verges or large grassland areas within the bushland setting. These areas often contribute to bushland management problems through weed invasion and excess water and nutrients.

In many cases these areas are quite large relative to the existing bushland and wetland remnant. These areas therefore offer a good opportunity to expand the area of bush in a contiguous manner and therefore contribute positively to a larger and more valuable remnant.

Wetlands also often contain small areas of fringing vegetation which could be further expanded by amending the shape and substrate of the wetland to extend the habitat area available for aquatic flora and fauna.

Greening Parkland Areas

Approximately 19% of green space in the Western Suburbs is comprised of large lawned areas with scattered trees. While some of these areas serve specific functions related to sport and other recreation activities others sit largely unused. These areas contribute to the sense of spaciousness and lushness within the urban fabric and reflect a largely European landscape paradigm brought to Australia by early settlers.

Public open space in this form provides an opportunity to establish vegetation at edges or other under utilised areas which will reduce expenditure on the maintenance of grassed areas, provide additional shade for recreational activities and maximise the environmental values of the area.

Constructed wetlands may be used as a component of the treatment of stormwater. Well designed and constructed wetlands that are vegetated can act as effective biological filters. The Water Sensitive Urban Design - Constructed Wetlands for stormwater managment, prepared by the Department of Water (June 2011) includes recommendations on the design of vegetated constructed wetlands.

Coastal and River Foreshore Areas

The coastal and river foreshore reserves are important for comprehensive greenways as they represent large contiguous areas of open space that contain significant natural vegetation. They are also areas that have high recreational appeal. Some are highly contentious when changes are proposed which are perceived to reduce views to the water bodies from the adjoining residence.

These areas provide an important opportunity to develop continuous areas of bushland from Mosman Park to City Beach and Matilda Bay.

Image left: Allen Park | Sally Wallace

It may not be possible to revegetate the entire foreshore with all the structural and floristic elements that would have originally occurred due to conflicts with adjoining owners over views. It should, however be possible to cater for continuity of vegetation allowing for views and vistas through the use of low growing species and sensitively placed trees.

Streetscapes

The road hierarchy throughout the western suburbs consists of:

- Main roads (eg Stirling Highway)
- Distributor roads (eg Rokeby Road)
- Local Roads (eg Dalkeith Road).

Streetscapes provide important conduits between different areas. They not only provide corridors for traffic and pedestrian movement but also the potential ability to provide corridors for wildlife, and defining the character of suburbs. Streetscapes are significant Green Infrastructure links within our urban fabric.

Street verge with potential for revegetation

The Greening Plan provides an opportunity to modify existing streetscapes to increase visual amenity, habitat value, microclimatic change and recreational value.

Developing greenways that follow existing streets and link into regional greenway zones is a priority. These areas can help to provide a visual and ecological link to the other more major zones, creating a pattern of recognisability through suburban areas.

This use of local native species maintains a strong sense of place. Streetscape verge corridors may also act as transitional vegetation areas between one vegetation type and another.

Streets will need to be assessed individually to determine their suitability for modification consistent with the aims and objectives of the Greening Plan. The assessment needs to consider existing and proposed adjoining land uses, views and vistas, cultural and historical context, scale and density of existing trees and built environment, parking and community values.

Streetscapes have the potential to demonstrate a number of new design ideas which contribute to the ecological and aesthetic value of the suburbs but do not necessarily remove the existing vegetation structure within the streetscape. This can be achieved by increasing the density of trees and planting verges, medians and roundabouts and innovative stormwater solutions.

Greening of Other Public Land

A large proportion of the land use in the Western Suburbs is owned in either freehold or vested with various state and commonwealth authorities. The railway reserve is one important example that contains a large area of land, provides an important corridor, is in the public gaze and connects to other areas of bushland.

These areas of government owned land can contribute positively to the environment through greening activities and habitat creation. In particular those areas that lie contiguous with existing bushland are important in the development.

Objective 3 | Targets

The following targets have been redefined for Objective 3 based on the 2002 Targets.

- Where possible, increase the quantity and quality of bushland adjoining existing remnants.
- Identify public open space areas that may contribute to greenway development.
- Establish community ownership of parks through precinct groups, schools or environmental volunteer groups.
- Incorporate public art to create spaces with unique identities that create a sense of place and local community ownership.
- Demonstrate the use of primarily local endemic flora in the design of public open space.
- Develop a continuous and contiguous greenway along the river foreshore and coastal areas. Coastal works should be conducted in consultation with coastal environmental volunteer groups where appropriate.
- Create interpretative displays that educate and inform the public about the environmental process in natural areas, and the Aboriginal and European history of the areas.
- Continue to use streetscapes (including verges) to connect natural bushland areas.
- Develop designs and plans for different road and street hierarchies (taking account of public safety and design requirements), which incorporate greenway principals, the retention of existing trees and the involvement of the community in the process.
- Work with relevant government land owners, leasees and departments to develop their land for greenway purposes.

Objective 4 | Green Community

Apart from gaining public support towards the objectives of the Greening Plan the main aims of community education should be about changing attitudes, removing apathy, clarifying misconceptions and encouraging positive actions.

Within the community there are range of views regarding the existence of bushland wihtin urban settings. Some may take the existence of bushland for granted, content to leave it in the care of others or complacent in the belief that it will always be there. There are others who consider bushlands a threat, viewing them as fire hazards and as havens for snakes, vermin and undesirable elements. Sometimes urban bushland has been treated as a waste ground for garden prunings, waste soil, grass clippings, and construction rubble. There are also misconceptions about the collection and removal of dead wood. These views may prevail due to unfamiliarity with local native flora and fauna and therefore lack of appreciation of the complexity and uniqueness of bushland ecosystems.

There are however many people in the community who value bushland highly and are willing to actively conserve and enhance it in conservation efforts with local authorities. Community involvement is crucial if the objectives of the greening plan are to be met. Community involvement:

- fosters a more interested and aware community, with a pride of achievement and sense of ownership in their local area
- engenders more acceptable and lasting decisions
- provides solid support and a mandate for implementing tough decisions
- allows information to transmit quickly and effectively through the community
- can bring the community together
- provides valuable information, expertise and feedback on environmental issues in the local area.

Residential Areas

Many of the proposed greenways incorporate residential streets and so private property plays a key role in how effective the greenways will function as wildlife corridors. There are a number of suburbs that have maintained large blocks with substantial gardens. The leafy character of many of the Western Suburbs is an advantage to green planning and aesthetic development of the suburbs. The large blocks enable a number of initiatives to be developed that encourage individual land owners to contribute to the Greening Plan. These include:

- the use of parts of back yards for an interconnecting greenway
- backyards providing interconnected networks for greenway development through private land
- the reduction in lawn areas to reduce water consumption and allow opportunity for increased planting trees and shrubs as habitat areas for birds, reptiles and insects
- the increase the use of native flora in highly designed gardens that demonstrate that the use of natives can develop the same aesthetic appeal as traditional non-native plants
- training and educational programs for land owners about how to manage and maintain native plants and gardens
- the creation of a sense of lushness by the use of native plants through colour, texture and plant density without the dependency on large volumes of water
- the integration of innovative irrigation systems such as grey-water systems
- the integration and encouragement of small scale frog ponds, nesting boxes and other habitat fabrication initiatives.

Smaller lots with large houses offer less greening opportunities because of the limited space available. However it is possible to use the available area to develop highly aesthetic gardens. Furthermore it is possible to integrate front gardens with street verges to create more habitat areas.

Objective 4 | Targets

The following targets have been redefined for Objective 4 based on the 2002 Targets.

- Encourage private residences adjacent to greenways to introduce local endemic flora into their property.
- Encourage the development of planting plans that provide appropriate local endemic species and incorporate any existing significant vegetation.
- Include requirements for local endemic species focused landscape plans into future major development approvals, especially those developments abutting existing greenways.
- Create knowledge partnerships with Traditional Owners within WESROC to align strategic greenways and sustainability principles where practicable.
- Encourage educational and advocacy role of local governments to highlight the significance of rich biodiversity and the value it holds across private and public land holdings.
- Incentivise community support for Urban Greenway Infrastructure by empowering through the utilisation of a Citizen Science approach for key projects.
- Collaborate with institutional and educational facilities to identify developing greenway projects to provide an

educational platform to positively change the behaviour of how we live for future generations.

» Encourage community participation in the maintenance of existing natural areas and empower environmental volunteer groups to continue their work in preserving natural areas within WESROC.

IMPLEMENTATION

WESROC Policy & Management

The Greening Plan is a concept which reaches far into the future. This strategy has to be seen as a long term commitment by the various Councils that form WESROC. In order to sustain the Greening Plan initiative the plan has to be incorporated into policies and statues that affect the everyday business of Council.

The following outlines the Implementation projects for each objective:

Objective 1 | Protection and Management

» Investigate integration of cultural land management practices and scientific climate knowledge to identify new management processes that ensure the resilience of the Greenways in a changing environment.

» Conduct an urban edge assessment to determine the key areas that require management and intervention in the creation of greenway interfaces.

» Develop a five year forward works programs for greenway development and incorporate into capital works budgets.

» Develop strategic documents to promote the protection of unmanaged remnant bushland.

Objective 2 | Expanding Greenways

» Prepare a strategic urban forest strategy for WESROC based on a review of individual urban forest strategies and urban heat island mapping to support increased canopy cover aligned with trails and key pedestrian networks across LGA areas.

» Engage with community to conduct a study of fauna species, particularly pollinators, to monitor impacts of completed greening works and ensure appropriate habitat is maintained or created.

» Conduct a study to identify key vulnerability social and environmental risk factors to identify strategic urban greenway infrastructure projects across WESROC.

» Seek community input in identifying areas within the WESROC suburbs that could be developed through short or long-term greening opportunities. Such as laneways, pocket parks, and car park areas with no trees.

» Conduct an assessment of the existing Urban Green Infrastructure to identify the economic value of the WESROC Greenways by taking account of the economic, health and social benefits.

Objective 3 | Greening Public Open Space

» Review extent of artificial lighting that may impact greenway biodiversity species complexities.

» Investigate integrations of dual language (English and Whadjuk Noongar) signage and interpretive displays for natural areas and consider using dual language for existing signage that requires replacement. The Whadjuk trails signage can be used as a template for this.

Objective 4 | Green Community

» Conduct a study to identify areas that are deficient in open space and would benefit from greening initiatives.

» Engage the community to explore their local greenways through educational events such as walking sections of the Whadjuk Trails.

Future Development & Projects

The Western Suburbs Greening Plan must operate within Town Planning Schemes, Policies and Strategic Plans of the various member Councils in order to achieve an integrated implementation and increased awareness of the Plan.

Where development of land may have implications for the Greening Plan, the relevant Council should inform the proponent of the relevance of the Greening Plan.

The proponent should also be encouraged, through liaison with relevant Council officers, to develop concept landscape plans to ensure that they are implemented in accordance with the Greening Plan.

Some of the other policy initiatives that need to be considered include:

» Critical assessment of requests for removal of any mature trees or vegetation;

» The development of policy guidelines for verge planting including species lists etc;

» Incorporation of Green Plan initiatives at the Development Application/Building Approval stages of development; and

» The encouragement of planting of local native vegetation on private land.

Greening Projects

Considerable assessment and planning is required for all projects and this work should be conducted through partnership between community and Council staff.

Each project area is to include a summary of the values and significant features of the defined site, issues to be considered and prioritised actions and budgets that are required. Member Councils of WESROC should be involved in choosing appropriate sites. Projects should be divided into two types based on scale; regional and local.

Regional

Regional project sites may span over a number of Local Government Areas and consequently may need to be managed by a number of Councils. This should be coordinated by WESROC.

Image left: Karda and Karak | Sally Wallace

Image: Christ Church Swan River Foreshore | Ecoscape

The coastal greenway is an example of a regional project site that will need to be coordinated by The Town of Cambridge, The City of Nedlands, The Town of Cottesloe and The Town of Mosman Park. The listed local governments could oversee the assessment and planning of the project site, although each local government will undertake the ground works. Allocated funding for the ground works could be subdivided to each local government based on the percentage of area of the whole project site. Some prioritised actions for the coastal greenway may include:

- Community involvement in weed control and dune revegetation with local native species.
- Renewal of derelict fencing.
- Fencing off and rehabilitation of informal access paths and re-aligning and consolidating formal access paths.
- Create interpretative displays that educate and inform the public about the environmental process in coastal areas.

Local

Local project sites are small areas that generally occur completely within a single Local Government Area. One local government is likely to undertake the assessment, planning and ground works. Some Prioritised actions may include:

- Involvement of community in streetscape design and planting.
- Supply Greening Plan information to surrounding residents and how they can contribute with their gardens.
- Identify locations for planting outside areas used for active or passive recreation within public open space.

Community Participation

Very few members of the community would want to be involved in more than one or two local sites whilst some will have a specific interest in the type of involvement they wish to participate. The Greening Plan not only needs to be broken down into individual sites but needs also to facilitate the establishment of specific interest working groups. Typical types of actions individuals and groups could support include:

- site action planning for specific sites
- working with established individual 'friends of', or working groups for specific sites
- seed collection and propogation of indigenous species
- revegetation / rehabilitation planting days
- bushland maintenance programs including weed eradication teams
- supporting existing and establishing new cultural and environmental local and regional trails
- permaculture / food production / city farm / community garden projects
- fauna watching and protection
- co-ordinating recreational cycle networks
- establishing school programmes
- community arts projects.

A significant challenge in implementing the Greening Plan will be harnessing the needs and priorities that individuals and groups may have whilst maintaining an overall strategic focus.

Funding

An increase in available funding for the Western Suburbs Greening Plan will be required. This may be through yearly budget allocation by Councils or from external funding sources. There are a number of external sources of funding available in the form of grants and employment and training programs, some which are described below.

Communities Environment Program

The Australian Government annually invests through the Communities Environment Program (CEP) to support a wide range of small-scale, on-ground projects that aim to conserve, protect and manage our environment.

The program seeks to support community groups—including those that may not be able to compete in larger and more competitive grant programs—to address local environmental priorities. The program also seeks to encourage the community to connect with their local natural environment and to build and strengthen local communities.

The following activities are provided as a guide to the types of projects that may be suitable for a grant under the program that align with the Greening Plan:

- monitoring local flora, fauna, water quality or marine debris
- supporting the recovery of threatened species and/or threatened ecological communities
- seed collection, propagation and planting of trees and understorey to control erosion and/or rehabilitate degraded natural habitats, riverbanks, wetlands and/or coasts
- improving or increasing the extent of suitable habitat, vegetation linkages and available food sources for native animals, including in urban areas
- reducing the impact of invasive weeds, pest animals, diseases and erosion on threatened species and natural habitats
- installing infrastructure (such as boardwalks) or fencing to manage access to sensitive natural habitats
- reducing the impact of waste and litter on natural habitats (e.g. litter clean-up events, marine debris collection or litter management infrastructure)
- workshops to increase community skills in monitoring, conserving, and/or protecting threatened species, ecological communities or other important environmental assets.

Coastwest

Coastwest grants support coastal land managers and community organisations to undertake projects to rehabilitate, restore and enhance coastal sites. Coastwest is a WAPC initiative administrated by the Department of Planning, Lands and Heritage.

Grants between $5,000 and $50,000 are available to support:

- the implementation of local and regional coastal plans and strategies, especially those devised in accordance with State Planning Policy2.6: State Coastal Planning Policy (SPP 2.6)
- coastal management actions that reduce exposure to coastal hazards and risks to preserve Western Australia's beaches and foreshores
- sustainable recreational and tourist use of the coast by assisting in the maintenance of the recreational amenity and provision of public access to the coast
- the capacity of Western Australian communities to increase their involvement in coastal zone management activities, through joint coastal research activities, education and training
- the identification, protection and maintenance of environmental values, aesthetic qualities, biodiversity and water quality in the coastal zone.

Greening Australia

Greening Australia believe that people thrive when nature thrives. Their personal, social and economic wellbeing are all inextricably linked with our land and sea. A healthy environment provides us with fresh air to breathe, clean water to drink, healthy soils for growing our crops, and medicine to heal us. Resilient ecosystems help to mitigate the effects of climate change.

But our environment and our biodiversity are in decline; more than 1,700 species and ecological communities are known to be threatened or at risk of extinction.

By restoring Australia's fragile and diverse ecosystems and habitat, we restore local economies with them, helping to create healthy, productive landscapes where people and nature can thrive.

Lotterywest | Building Community

The objective of this grant program is to create opportunities for the whole community to come together as a means of enhancing community connection, strengthening social capital and encouraging community to repair and rebuild itself. Key outcomes focus of this grant program:

- Community is connected through local initiatives that strengthen wellbeing, promote participation and volunteering, and encourage re-connection after a period of distancing and isolation.
- Marginalised, minority and disadvantaged groups at risk of experiencing prolonged impacts of social isolation and discrimination are actively included in community.
- Aboriginal people retain and strengthen connection to country, identity and culture.

Corporate Sponsorship

There are a number of bushland management activities currently funded (either jointly or wholly) by corporate parties, such as Alinta Gas, Western Power, Alcoa, Woodside, insurance companies and banks. This avenue for funds for implementing works should be explored more fully.

Image: Charles Court Foreshore | Ecoscape

ACRONYMS

ACRONYM	MEANING
WESROC	Western Suburbs Regional Organisation of Councils
DAA	Department of Aboriginal Affairs
AHD	Australian Height Datum
WAPC	Western Australian Planning Commission
Ha	Hectare
DPAW	Department of Parks and Wildlife (now refered to as Department of Biodiversity, Conservation and Attractions)
DBCA	Department of Biodiversity, Conservation and Attractions
TEC	Threatened Ecological Community
SCP	Swan Coastal Plain
TF	Threatened Flora
PF	Priority Flora
BC Act	Biodiversity Conservation Act 2016 Western Australia
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
WA	Western Australia
LGA	Local Government Authority
POS	Public Open Space
UWA	University of Western Australia
PHD	Doctor of Philosophy
UHI	Urban Heat Island
GI	Green Infrastructure
CEP	Communities Environment Program

Image left: Cottesloe Foreshore | Ecoscape

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Pollinator conservation — the difference between managing for pollination services and preserving pollinator diversity Deepa Senapathi1 , Jacobus C Biesmeijer2 , Thomas D Breeze1 , David Kleijn3 , Simon G Potts1 and Luı´sa G Carvalheiro (2015)

APPENDIX 01
RECOMMENDATIONS & IMPLEMENTATION ACTIONS

#	RECOMMENDATIONS	IMP#	IMPLEMENTATION PROJECTS
Objective 1: Protection and Management			
1.1	Retain and improve, where possible, all existing bushland and wetlands found within the Western Suburbs.	*IMP1.1*	*Investigate integration of cultural land management practices and scientific climate knowledge to identify new management processes that ensure the resilience of the Greenways in a changing environment.*
1.2	Ensure Management Plans for bushland and wetlands are reviewed and updated when required and include an avenue for Aboriginal custodians to have proactive and holistic input into the review and development.	*IMP1.2*	*Conduct an urban edge assessment to determine the key areas that require management and intervention in the creation of greenway interfaces.*
1.3	Develop a strategy to identify where greenways can be linked across council boundaries within the Western Suburbs.	*IMP1.3*	*Develop a five year forward works programs for greenway development and incorporate into capital works budgets.*
1.4	Work with Government agencies, leasees and land owners to protect remnant bushland within their management control.	*IMP1.4*	*Develop strategic documents to promote the protection of unmanaged remnant bushland.*
Objective 2: Expanding Greenways			
2.1	Maintain and, where possible, increase greenways linking and engaging with living water to encourage movement of local endemic biota and to create regional linkages within and between local government managed land.	*IMP2.1*	*Prepare a strategic urban forest strategy for WESROC based on a review of indivdual urban forest strategies and urban heat island mapping to support increased canopy cover aligned with trails and key pedestrian networks across LGA areas.*
2.2	Expand the greenway program by partnering with individual, corporate and instiutional land owners or leasees to enhance the ecological and aesthetic characteristics of their land to support greenway development.	*IMP2.2*	*Engage with community to conduct a study of fauna species, particularly pollinators, to monitor impacts of completed greening works and ensure appropriate habitat is maintained or created.*
		IMP2.3	*Conduct a study to identify key vulnerability social and environmental risk factors to identify strategic urban greenway infrastructure projects across WESROC.*
		IMP2.4	*Seek community input in identifying areas within the WESROC suburbs that could be developed through short or long-term greening opportunities. Such as laneways, pocket parks, and car park areas with no trees.*
		IMP2.5	*Conduct an assessment of the existing UGI to identify the economic value of the WESROC Greenways by taking account of the economic, health and social benefits. Environmental benefits?*

#	RECOMMENDATIONS	IMP#	IMPLEMENTATION PROJECTS
Objective 3: Greening Public Open Space			
3.1	Where possible, increase the quantity and quality of bushland adjoining existing remnants.	*IMP3.1*	***Review extent of artificial lighting that may impact greenway biodiversity species complexities.***
3.2	Identify public open space areas that may contribute to greenway development.	*IMP3.2*	***Investigate integrations of dual language (English and Whadjuk Noongar) signage and interpretative displays for natural areas and consider using dual language for exisiting signage that requires replacement. The Whadjuk trails signage can be used as a template for this.***
3.3	Establish community ownership of parks through precinct groups, schools or environmental volunteer groups.		
3.4	Incorporate public art to create spaces with unique identities that create a sense of place and local community ownership.		
3.5	Demonstrate the use of primarily local endemic flora in the design of public open space.		
3.6	Develop a continuous and contiguous greenway along the river foreshore and coastal areas. Coastal works should be conducted in consultation with coastal environmental volunteer groups where appropriate.		
3.7	Create interpretative displays that educate and inform the public about the environmental process in natural areas, and the Aboriginal and European history of the areas.		
3.8	Continue to use streetscapes (including verges) to connect natural bushland areas.		
3.9	Develop designs and plans for different road and street hierarchies (taking account of public safety and design requirements), which incorporate greenway principals, the retention of existing trees and the involvement of the community in the process.		
3.10	Work with relevant government land owners, leasees and departments to develop their land for greenway purposes.		
Objective 4: Green Community			
4.1	Encourage private residences adjacent to greenways to introduce local endemic flora into their property.	*IMP4.1*	***Conduct a study to identify areas that are deficient in open space and would benefit from greening initiatives.***
4.2	Encourage the development of planting plans that provide appropriate local endemic species and incorporate any existing significant vegetation.	*IMP4.2*	***Engage the community to explore their local greenways through educational events such as walking sections of the Whadjuk Trails.***
4.3	Include requirements for local endemic species focused landscape plans into future major development approvals, especially those developments abutting existing greenways.		
4.4	Create knowledge partnerships with Traditional Owners within WESROC to align strategic greenways and sustainability principles where practicable.		
4.5	Encourage educational and advocacy role of local governments to highlight the significance of rich biodiversity and the value it holds across private and public land holdings.		
4.6	Incentivise community support for Urban Greenway Infrastructure by empowering through the utilisation of a Citizen Science approach for key projects.		
4.7	Collaborate with institutional and educational facilities to identify developing greenway projects to provide an educational platform to positively change the behaviour of how we live for future generations.		
4.8	Encourage community participation in the maintenance of existing natural areas and empower environmental volunteer groups to continue their work in preserving natural areas within WESROC.		

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